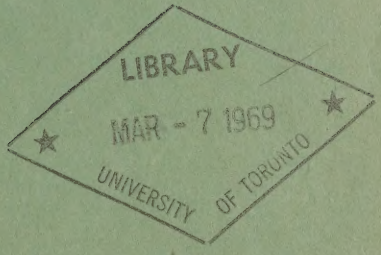
CANADA'S MANPOWER REQUIREMENTS IN 1970

by

Noah M. Meltz and G. Peter Penz



Research Branch
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DEPARTMENT OF MANPOWER AND IMMIGRATION
CANADA
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FOREWORD

This study is the first of a series which will be concerned with aspects of manpower planning. These studies, as they arise from the research program of the Department of Manpower and Immigration will discuss such matters as projections of the labour force and of the skills of manpower which will be available in the future; projections of the effects of economic growth upon the requirement for manpower, and especially for highly trained and skilled manpower, the efficient utilization of human resources, and studies of the movements of manpower both international and domestic, and of the behaviour of the labour market.

This study represents a projection of the requirements for manpower in Canada in 1970. It is an assessment of the implications for manpower of the projection of the economy which was made in the First Annual Review of the Economic Council. The projection of manpower was made in order to assess the investment which would be required in education and training, particularly in the latter, to meet the economic targets which were proposed by the Economic Council.

The study was begun in the Department of Labour under the direction of J.P. Francis. It has been continued under the direction of K.V. Pankhurst in the new and expanded research program of the Department of Manpower and Immigration. Professor Noah M. Meltz of the University of Toronto prepared the projection of manpower requirements by industry and by major occupation groups and made a first brief attempt to calculate their educational implications. Peter Penz of the Department of Manpower and Immigration has revised some of the earlier work and has developed and extended the assessment of the implications for education and training of the occupational projections.

W.R. Dymond
Acting Director
Research Branch
Program Development Service

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INTRODUCTION

The study described in the following pages is a projection of the effects of the potential growth of the economy upon future requirements for manpower in Canada. Specifically, it assesses the total amount of education and training that would be needed in order to provide a sufficient amount of manpower with the required skills in each occupation group so that the targets proposed by the Economic Council of Canada in its First Annual Review in 1964 can be met. Thus it contributes towards making an assessment of the amount of investment in education and training needed to equip the labour force in adequate numbers with the skill levels required to bring about the goals proposed by the Economic Council.

A projection is a way of thinking in an orderly manner about the future in order to provide a basis for the decisions which have to be made about the future. In principle, a projection is very simple; it represents a view of what the economy will be like if a certain set of assumptions is satisfied. The assumptions concern both the structure of the economy and pattern of its behaviour. They also concern the values of the variables within the economic system at any time, such as for example the amount of foreign trade, the level of unemployment of the total size of the labour force. A projection, therefore, needs to be thought of as a package: it is a certain set of future possibilities which will be achieved if a certain set of conditions is satisfied. The projection, and the conditions upon which it is made, must always be read together.

Since a projection depends upon a certain set of assumptions, it follows that a different set of assumptions would yield a different projection. The process of making projections, therefore, is capable of providing an orderly and systematic basis for examining the effects of different alternative courses of action and so is potentially an extremely valuable instrument in the process of planning and policy making.

It should be clear that a projection is fundamentally different from a forecast. A projection does not, like a forecast, depend upon an expectation that the complete set of assumptions upon which it has been made will be exactly fulfilled. It cannot be emphasized too strongly that a projection is not a statement about what will happen, nor about what should happen. It is simply a statement about what could happen under given conditions.

Since various different projections can be made using different assumptions, projections are not targets, at least not when they are first made, and no single projection should be taken as a target. A target should be established by making a series of different projections in order to examine the assumptions upon which each projection is built, and the effect of each of those different possible sources of action. A decision can then be made, on the basis of whatever criteria are chosen, about which projection is best. In practice, the time and effort required to make even a single projection is so great that there is a danger of it being adopted as a target without an examination of the alternative possibilities.

The projection presented in this study does not therefore necessarily represent the best way of meeting the goals proposed by the Economic Council. If it turned out to be the best approach after an examination of other possibilities, it would be by coincidence. In the study which is presented in this volume, it is clear that had different assumptions been made about the rate of growth of the economy, or of certain industries, or of the occupational structures chosen within each industry, then different projections would have resulted of the amount of investment in education and training required to meet the Economic Council's goals. Had different assumptions been made, they would no doubt have suggested different amounts of post-secondary education and training, but it seems clear that the amounts required would still be extremely large. Thus the study yields an indication that an increase is required without at the moment being able to indicate the precise amount of the increase required. What emerges from this study is that the satisfaction of the Economic Council's goals requires a considerable increase in investment in post-secondary technical and vocational training.

The process of making even a simple projection is, in practice, extremely complicated, entailing a considerable amount of elaborate calculation which is extremely expensive of time and resources. The calculations would be considerably more complicated if all of the required data were available and if the behaviour of the labour market were fully understood. The complex calculations, however, conceal a good deal of ignorance about the behaviour of the economic system; and many of the assumptions which have gone into making the projections have had to be chosen for convenience.

The projection in this volume is very elementary. It is based upon relatively simple assumptions which are described. It is also based upon an extremely simple method, the extrapolation of observed recent statistical trends, and does not take full or explicit account of the ways in which different parts of the economy are linked to each other. In principle, it assumes that changes in the relationships within the economy will follow the past pattern of change.

These considerations of the nature of projection are important, because they determine the use which can be made of them. Projections are a method of research and a tool of planning which are still in their infancy, although the approach to them is being considerably developed in the next part of the research program of the Department which is now under way. The projections contained in this study were designed to develop a method which would be used to assess the total effect of economic growth upon the need for education and training. It was intended to be used as a guide to the total volume of investment required in these areas. Whilst there may be still considerable doubt about the best amount of investment in education and training it remains clear that a considerable increase is required.

In addition, the projection indicates the broad lines of the future changes in the structure of the Canadian economy and its occupational composition. Whilst these trends have been calculated as part of the process of assessing the total need for manpower, and for investment, and while they do not provide a firm basis for assessing the gaps between future requirements and supplies in each occupation, the projections nevertheless give some insight into the types and rates of change which are in progress within the labour force. They also help to demonstrate the kinds of demands which will be made upon the labour force and upon the education and training system by the advance of technology.

The calculations in the projection have been made in some detail in order to take account of changes within the labour force when building up a view of the total requirement for education and training. The margins of possible error in the detailed calculations are unlikely to affect the broader conclusions which emerge from the study, but they cannot provide a suitable basis for the assessment of the specific manpower imbalances within each occupation.

In the next stage of the research programme of the Department of Manpower and Immigration, work is in hand to develop a projection system which may be suitable for making estimates of potential future scarcities and surpluses of manpower by occupation. However, although the present projections are far from perfect, there is a choice between using no information at all or making guarded use of them. They can be used as a broad framework within which more detailed projections may be made for specific detailed occupations.

K.V. Pankhurst

SUMMARY

1. The purpose of this study is to determine the manpower implications of the potential output projections for 1970 prepared by the Economic Council of Canada in its First Annual Review[1].

2. In addition to the projections prepared by the Economic Council, the data used consisted of: a) annual Labour Force Survey data for the industry structure of employment, and the occupation structure of employment, and b) decennial census data for the occupation structure of the labour force in each industry sector, for the education structure of each occupation group and for the disaggregation of occupation groups into classes.

3. The manpower implications are presented in four ways:

(a) the industry structure of manpower requirements in 1970,

(b) the occupation structure of manpower requirements in 1970,

(c) the required education structure of the labour force in 1970,

(d) the required education structure of entrants to the labour force between 1961 and 1970.

4. The Economic Council estimated employment in 1970 in three industry sectors: agriculture, community service, and public administration, as well as for the residual commercial, non-agriculture category. A more detailed structure of manpower requirements within the commercial non-agriculture sector was obtained by projecting the trend in annual data of the industry structure of employment for the post-war period to 1970. Twelve industry sectors were used. The projections indicate a relatively rapid rate of growth of job opportunities in public, utilities, finance and business service, community service and public administration (government). The trend in personal service, if based on the relatively recent period, indicates a fairly rapid rate of growth, but if based on the whole post-war period, a rate of increase slightly below that of the labour force. There is likely to be somewhat more than average growth in construction and trade, and somewhat less than average growth in manufacturing and transportation and communication. Employment opportunities in agriculture and forestry are declining.

5. The occupation structure of manpower requirements in 1970 was obtained by taking the industry estimates together with projections of decennial data on the occupation structure of each industry sector between 1931 and 1961. Thirteen occupation groups were used. The overall occupation structure thus projected indicates a sharp increase in requirements for professional occupations and relatively rapid growth for the clerical and service groups. The primary occupations are projected to experience a substantial decline, and no significant increases are seen in the case of labourers. The projections of employment opportunities for the other occupation groups follow approximately the growth pattern of the whole labour force.

6. The projection of the required education structure of the labour force was made by extrapolating to 1970 the education structure in each occupation group in 1941, 1951 and 1961, then aggregating these structures for the projected occupation groups. The levels of education used were 0-8 years, 9-12 years and 13 or more years of schooling. The results indicate that while the opportunities for those with no more than elementary education are increasing in absolute numbers, they are growing much less than the labour force as a whole and their proportion of employment is sharply declining. Job opportunities for those with high-school education are projected to grow at a rate approximately equal to that of the labour force and for those with higher education at a much faster rate.

7. An alternative projection of the education structure of manpower requirements was also made. It involved the projection of the required education structure of the labour force entrants. To do this it was

[1] Economic Council of Canada, *First Annual Review*, (Ottawa, Queen's Printer, 1964), p. 32.

necessary to disaggregate the projection of occupation groups into several hundred occupation classes, determine the required net growth of each class between 1961 and 1970, estimate the attrition in each class and ascertain the educational qualifications applicable to that group of jobs. The educational qualifications were considered in terms of years as well as types of schooling and training. The results suggest that only a very small proportion of jobs will be available for young people who have not completed their elementary education and high school completion will be required of two-fifths of the entrants. One-sixth should be qualified with trade school or apprenticeship training, although part of that requirement might be met by on-the-job training. University graduates should make up one tenth of the labour force entrants and another one-tenth should have some other form of post-secondary schooling. Nearly half of the latter represent opportunities for graduates from institutes of technology.

8. Because applied manpower economics is still in a fairly primitive stage of development, the methodology used in this study is very simple and involves some rather heroic assumptions. Probably the most crucial are the assumptions that: a) the industry and occupation structures of employment in the past have been determined primarily by the structure of output and by the prevailing technology, rather than by labour supply conditions interacting with demand conditions; and b) the structure of output and technology are independent of the skill structure of manpower supply. The projection of the required education structure of the labour force is based on the assumption that the education structure too is labour-demand determined and independent of labour supply conditions. In the case of the projection of the required education structure of new entrants to the labour force it was assumed c) that for each skill, a unique set of formal education and training qualifications is required, and d) that there is no net inter-occupational mobility.

9. Because these assumptions are gross over-simplifications of reality, the projections which are presented here should be considered as experimental rather than definitive. The reader should not use them for economic decision-making, except as very crude guidelines of what might be expected to happen if the Canadian economy reached the potential estimated by the Economic Council in its First Annual Review.

CHAPTER I

OUTLINE OF THE PROJECTION METHOD

In its First Annual Review the Economic Council of Canada set out a projection of the Canadian labour force in 1970. From this projection the Council determined how many jobs the economy has to provide in 1970 in order to have 97 per cent of the labour force employed. The purpose of this paper is to project the distribution of the jobs among the various industries and occupations, together with the educational qualifications required for these jobs. In other words, this exercise consists of the elaboration of the Council's projection of the required level of employment in terms of manpower requirements and their characteristics.

The projection of manpower requirements in this study consists of three main stages. The first is to project the future structure of employment by industries. The second is to project the occupational structure of each industry; and the third is to assess the educational requirements of the projected occupational composition.[1]

Requirements by Industry

If a theoretical model were to be closely followed, projections of labour requirements by industry would be made according to the following steps. First, aggregate demand in the economy would be projected. Secondly, the industrial structure of final demand would be estimated. Thirdly, from this, the industrial distribution should be derived by an input-output method. Finally, the industrial breakdown of employment would be obtained from the structure of output and a related set of projections of labour productivity in each industry.[2] However, this method was not entirely feasible and a short-cut approach was taken by simply projecting the percentage distribution of employment by industry. There are three reasons for not adopting the theoretically more appropriate method outlined above. First, the employment projection made by the Economic Council, and which formed the starting point for this study, was derived from a projection of the labour force taking account of the objective of an employment rate of 97 per cent rather than from a projection of real output. Secondly, the data required for an inter-industry input-output analysis are available at present only for the years 1949, 1956 and 1959. These tables were prepared by DBS. A more elaborate model, based on 1961, is being prepared by DBS, and it would be precarious to derive projections to 1970 from them. Thirdly, productivity rates in the various industries are subject to variation, and time trend projections are of relatively little value until such time as the more important determinants can be quantified. The last two items indicate the many pieces of basic research which have to be undertaken before adequate projections can be made.

The structure of employment by industry was projected by making linear extrapolations of the share of each industry of aggregate employment. In most industries much of the deviation of their percentage component in total employment from the linear trends can be explained statistically using the concurrent overall unemployment rate. Since the unemployment rate is probably as good an indicator of cyclical activity as any other available quantified variable, the introduction of the unemployment rate as an independent variable in the regression analysis of the industrial structure of employment provides a form of implicit cyclical adjustment for the industrial structure of output and productivity combined.

Requirements by Occupation

Having calculated manpower requirements by industry group, the next stage was to project the required occupational structures of those industry groups in terms of thirteen major occupation groups.[3]

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[1] For a discussion of a number of different methods of making manpower projections see: Ozay Mehmet, *Methods of Forecasting Manpower Requirements* (Ontario Department of Labour and the Centre for Industrial Relations of the University of Toronto, Toronto, 1965).

[2] The factors determining labour productivity, i.e. technical conditions of production and relative factor prices, are discussed in Meltz, *Changes in the Occupational Composition of the Canadian Labour Force, 1931-1961,* Economics and Research Branch, Department of Labour, Occasional Paper No. 2 (Ottawa, Queen's Printer, 1965), pp. 3-5.

[3] The decennial population census classifies occupations at three levels: major group, class and title. *Manpower in Canada, 1931 to 1961—Horizontal Statistics of the Canadian Labour Force,* Department of Manpower and Immigration, which provides the occupational data for this study, classifies the labour force according to 117 occupation classes and 13 major occupations groups. The 117 comparable occupation classes compare with 280 total occupations in the 1951 cencus classification manual.

The determinants of the occupation structure of an industry have been conceived in economic theory as the level of the output of the industry's firms, its technical conditions of production and the relative prices of the different types of labour and other factor inputs, whether complementary or substitutable. Relative factor prices, however, introduce the problem of circularity in that they are generated by the interaction of factor demand and supply and, in turn, are determinants of factor demand and supply.

For this reason most studies of manpower requirements do not take into account the wage rates or other factor prices and thereby exclude the equilibrating function of labour and other factor markets. The relationship between the occupation structure of an industry and the scale of production of the various firms in the industry has not been explored either, because of the statistical problems of disaggregating the data sufficiently and the fact that, to a large extent, the scale of operations will be reflected in the technical conditions of production anyhow.

This leaves us with the hypothesis suggested by H.S. Parnes,[4] that technology is the main determinant of changes in the structure of occupations and that technology, the occupation structure and labour productivity are all correlated. The problem here is that technology is a rather general and vague term which should really be broken down into conceptual sub-components. It has not yet been possible to devise a satisfactory measure for it. The immediate alternative would be to project the occupation structure as a function of its hypothesized correlate, that is, labour productivity. However, there is no indication that labour productivity by industry follows a significantly more consistent trend than the respective occupation structures themselves.

For these reasons neither technology nor productivity were explicitly considered as variables in the occupation structures. It has therefore been assumed that these factors—and thus also the occupation structures—bear some relation to time. Since productivity generally grows along a logarithmic rather than a linear trend,[5] this would imply that, if the occupational composition of employment by industry is linearly related to industrial productivity, the percentage occupational composition will change logarithmically with respect to time. However, the linear time trend projections of the occupation structure by industries, which have actually been used and, which in effect imply declining productivity growth rates, are justified on the basis that in a seven-year interval the difference between a linear and a logarithmic trend is probably negligible when compared to the random deviations from either trend.

Finally, the basic assumption which is implied in the concept of manpower requirements must be made, namely, that the relationship between technology and the occupational structure is unique for each industry and that there is no significant substitutability within this structure at any given level of technology.

Educational Requirements

The third stage is to assess the numbers of people required at various levels of education to satisfy the projected occupational composition.

The concept of required educational qualifications can be interpreted in either of two ways: (a) a worker requires a certain educational background to be able to perform a certain job or productive function (functional requirements); (b) a job applicant requires a certain education to be accepted by employers (employer requirements). The latter may be greatly influenced by supply conditions, since employers may look for the best educated applicants rather than those who merely have the functionally necessary background. Aside from these two alternative interpretations, there is the additional problem of whether educational requirements are to be stated either (1) in terms of the years required in the various parts of the prevailing education system, or (2) in terms of the necessary subjects and skills that have to be mastered. In the former case, if the system does not provide for certain subjects or skills, this deficiency cannot be expressed in the projection, nor does it make possible the separation of the economic, or functional, component of education from a residual component which must then have either a cultural justification or be regarded as superfluous. However, in these projections, the educational system is taken as given, and requirements are stated in terms of years and types of schooling. Furthermore, a functional approach to education must await the Canadian version of the *Dictionary of Occupational Titles*. Consequently, employer expectations are taken as the main relevant criterion.

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[4] *Forecasting Educational Needs for Economic and Social Development* (Organization for Economic Co-Operation and Development, Paris, 1962).

[5] A linear growth in productivity would mean a declining rate of growth in productivity.

The projection of educational requirements was derived from the projection of occupational requirements by two methods. One of them is consistent with the approach used in the two previous stages of projection. It involves projecting the percentage distribution of persons in each occupation group by the educational level attained. The heterogeneity of educational levels in each occupation group can reflect both the heterogeneity of skills within the occupation group and the heterogeneity of educational avenues to each homogeneous occupational unit. To the extent that it does the former, it is a refinement of the second stage of the projection, that is, of the projection of skills, in terms of occupations, by industries. However, instead of projecting education by occupation by industry, that is, a three-dimensional matrix, which should be done if the skill structure that can be identified by the structure of educational qualifications within each occupation group varies by industry, only the aggregate occupation structure has been broken down by education levels. This is justified on the basis of the assumption that this education-specific skill structure in each occupation is similar for all industries, or, at least, that the variety of such skill structures is randomly distributed between industries in which employment is growing rapidly and those in which it is growing slowly or declining.

The projections in the two previous stages, however, were based on the assumption that employment by industry and occupation was primarily demand-determined. In the case of the level of education attained the supply determinant is probably much more dominant than in the two earlier projection stages. Consequently, an alternative approach, which is much less affected by supply, has been applied. It consists of attributing unique required educational level to each occupation class. These assumed levels were selected, under advice, on the basis of what educational qualifications were considered to be functionally necessary to perform the typical tasks of each occupation as well as what was thought to be acceptable to employers in the 1960's.

However, since the educational levels currently being required are, in many cases, not likely to have applied to those who were in the labour force before this decade, they have been applied only to the estimates of the number of entrants required during 1961-70. The number of entrants required by occupation have been estimated by adding the estimates of the net growth (derived from the projection of total employment, of its industry break-down, and of the coefficients of the industry-occupation matrix) to estimates of attrition, based on the 1961 age structure of the occupation.

While employer standards will be shaped to a certain extent by supply conditions, the latter method is more consistent with the manpower-requirements approach than the projection of the education-occupation matrix. In addition, it has the very important advantage that it does not have to specify education solely in terms of the number of years of schooling, but can specify various types of education which are not available in historical data. Of course, it has the significant drawback that it is heavily based on discretionary judgment, and more or less educated guesses. Consequently, it must be realized that the results are no more than a crude first approximation and that a very important part of the value of this exercise is to bring out problems which have to be solved by additional research, one of them being the specification of educational requirements for the various occupations.

CHAPTER II

INDUSTRY STRUCTURE

The Economic Council Projection

In 1964-65, the Economic Council of Canada made a projection for 1970 of output in four major industry sectors required in order to ensure that no less than 97 per cent of the labour force will be employed. This was based on the projection of the working-age population in 1970 by age and sex which was derived from a projected age-sex structure of mortality rates and projections of gross immigration and gross emigration and their age-sex structures.[1] Gross immigration was assumed to be 115,000 in 1964 and 125,000 in the following years, and gross emigration was assumed to be 75,000 each year.[2] The size of the labour force in 1970 was then obtained by applying a projection of age-sex-specific participation rates to the population projection.[3] By applying the 97 per cent employment target the objective in terms of absolute numbers of employed was obtained. This figure was then broken down into the agricultural, public administration, community services and commercial non-agricultural sectors,[4] as is shown in Table 1 and Figure 1.

Employment in agriculture was obtained by projecting the logarithmic trend of agricultural employment during the whole postwar period (up to 1963) to 1970. Employment in public administration was projected from the basic assumptions that (1) the potential output[5] of all levels of government combined, excluding defence, would rise at a rate slightly faster than the average for 1946-63 and (2) output per man would remain constant at the 1957-63 average. The projection of employment in community service was derived from the assumptions that (1) potential output would increase at a rate which is more rapid than in the first 10 postwar years, but slightly slower than in 1956-63, (2) average hours of work per man would decline along the extrapolation of the (apparently logarithmically) regressed post-war path, and (3) output per man-hour would remain constant at the 1963 level.

The projection of employment in the commercial non-agricultural sector was then simply taken to be the residual. However, this last component –too heterogenous for manpower projections–had to be broken down into industry sectors. The remainder of the chapter describes how the breakdown was obtained.

The Data

The data that were used by B.J. Drabble in his projection of employment by the four industry sectors were obtained from the Dominion Bureau of Statistics' Labour Force Survey. While Labour Force Survey data are subject to sampling errors, it is preferable to decennial population Census data because it is provided on a monthly basis and can therefore be converted into annual averages. In addition, the surveying is conducted by more experienced interviewers.

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[1] See: Y. Kasahara, "Population Projections to 1970", in F.T. Denton et al., *Population and Labour Force Projections to 1970*, Staff Study No. 1, Economic Council of Canada, December 1964 (Queen's Printer, Ottawa, 1965).

[2] The concept of "gross emigration" apparently includes the net effect of the flow of returning residents. The sex breakdown of gross immigration was projected on the basis of the assumption that in 1966-70 the numbers of males and females would be equal and in 1964 and 1965 the sex structure would reflect the movement from the ratio in 1963 to the projected equality in 1966. The age structure for each sex was determined on the basis of the observed distribution in 1954-63. The age-sex structure of "gross emigration" was based on the U.S. statistics on Canadian-born immigrants.

[3] See: F. T. Denton and S. Ostry, "Labour Force Projections to 1970", in F.T. Denton at al., *Population and Labour Force Projections to 1970*, Staff Study No. 1, Economic Council of Canada, December 1964 (Queen's Printer, Ottawa, 1965). Since the completion of the first draft of this publication and the computations for it, the Economic Council has published a new set of population and labour force projections (Wolfgang M. Illing et al., *Population, Family, Household and Labour Force Growth to 1980*, Staff Study No. 19, Economic Council of Canada, September 1967 (Queen's Printer, Ottawa, 1967). On the basis of assumptions about immigration and the female participation rate, which are significantly different from those used by Denton, Kasahara and Ostry, the civilian labour force was projected to be 2.7 per cent higher than the Denton-Kasahara-Ostry projection. Even the lower alternative projection of the 1967 Staff Study is still 1.2 per cent higher than that of the 1964-65 Staff Study. The implications of these discrepancies are discussed in footnotes in the relevant pages below.

[4] B.J. Drabble, *Potential Output 1946 in 1967*, Staff Study No. 2, Economic Council of Canada, December, 1964 (Queen's Printer, Ottawa, 1965). If the Illing projection of the labour force had been used, the figure for employment in the commercial non-agricultural sector would be 3.8 per cent higher than the Drabble figure which was used.

[5] "Potential" is defined as the level of activity at which 3 per cent of the labour force are unemployed.

TABLE 1

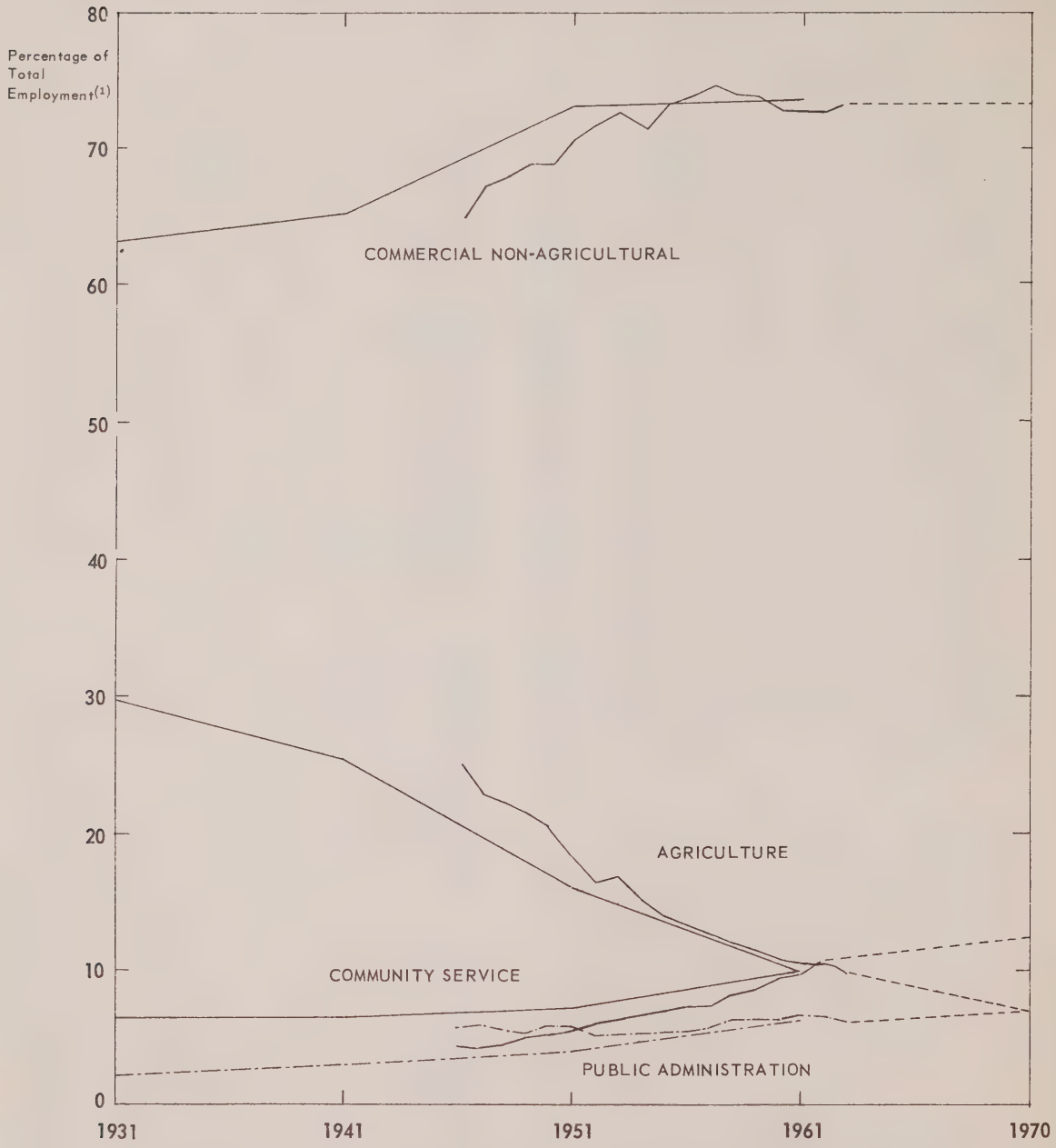
Civilian Employment by Industry Sector for Canada 1946 - 1963 With a Projection for 1970

Year	Numerical Distribution ('000)					Percentage Distribution				
	Total	Agri-culture	Public Admin.	Com-munity Service	Commercial Non-Agriculture	Total	Agri-culture	Public Admin.	Com-munity Service	Commercial Non-Agriculture
					Historical Data					
1946	4639	1174	255	203	3007	100.0	25.3	5.5	4.4	64.8
47	4302	1111	275	207	3209	100.0	23.1	5.7	4.3	66.9
48	4863	1085	262	220	3296	100.0	22.3	5.4	4.5	67.8
49	4969	1072	262	237	3398	100.0	21.6	5.3	4.8	68.3
50	4949	1008	284	252	3405	100.0	20.4	5.7	5.1	68.8
1951	5063	930	284	269	3580	100.0	18.4	5.6	5.3	70.7
52	5146	886	269	293	3698	100.0	17.2	5.2	5.7	71.9
53	5235	858	272	320	3785	100.0	16.4	5.2	6.1	72.3
54	5243	878	280	339	3746	100.0	16.7	5.3	6.5	71.5
55	5364	819	287	360	3898	100.0	15.3	5.4	6.7	72.6
1956	5585	776	299	387	4123	100.0	13.9	5.4	6.9	73.8
57	5725	744	299	420	4262	100.0	13.0	5.2	7.3	74.5
58	5694	712	319	448	4215	100.0	12.5	5.6	7.9	74.0
59	5855	692	349	498	4316	100.0	11.8	6.0	8.5	73.7
60	5955	675	372	563	4345	100.0	11.3	6.2	9.5	73.0
1961	6049	674	382	599	4394	100.0	11.1	6.3	9.9	72.7
62	6217	653	390	658	4516	100.0	10.5	6.3	10.6	72.6
63	6364	641	387	675	4661	100.0	10.1	6.1	10.6	73.2
					Projection					
1970	7883	543	542	993	5805	100.0	6.9	6.9	12.6	73.6

SOURCE: B. J. Drabble, *Potential Output 1946 to 1970*, Staff Study No. 2, Council of Canada (Queen's Printer, Ottawa, 1965), Tables 23 and 24.

FIGURE 1

PERCENTAGE DISTRIBUTION OF TOTAL EMPLOYMENT[1] BY INDUSTRY SECTOR IN CANADA 1931-1963 WITH A PROJECTION TO 1970



(1) The decennial FIGURES, 1931-1961 are Labour Force Data (EMPLOYED PLUS UNEMPLOYED)

Sources: The decennial Figures, 1931-1961, were prepared by the Economics and Research Branch, Department of Labour on the basis of Census data. The annual figures, 1946-1963, and the projection for 1970 are based on Table 1.

TABLE 2-A

Numerical Distribution of Commercial Non-Agriculture Employment by Industry, for Canada, 1931-61, 1946-63 with Projections to 1970

('000)

Industry	Census (Labour Force) ('000)				Labour Force Survey Data (Employment) ('000)							
	1931	1941	1951	1961	1946	1947	1948	1949	1950	1951	1952	1953
Total Commercial Non-Agriculture	2,266	2,668	3,718	4,500	3,007	3,209	3,296	3,398	3,405	3,580	3,698	3,785
Forestry	98	94	130	108	84	94	97	69	82	115	97	83
Fishing		51	51	35	27	23	22	26	39	−30	28	26
Mining	72	93	104	119	74	69	74	84	75	79	92	91
Manufacturing	724	966	1,361	1,487	1,214	1,264	1,268	1,303	1,316	1,305	1,333	1,384
Construction	250	220	351	466	224	251	286	317	331	348	338	347
Utilities	25	26	62	70	33	38	41	45	46	51	58	58
Transportation and Communication	277	267	403	455	344	373	371	364	376	398	421	423
Trade	383	465	710	928	573	637	649	647	644	718	785	816
Finance	92	90	144	229	124	131	140	144	142	154	162	165
Recreation	18	18	29	40	23	27	28	29	29	29	32	28
Business Service		12	59	120	37	44	46	47	51	54	60	62
Personal Service	322	366	314	443	269	280	277	283	294	282	308	304

Industry	Labour Force Survey Data (Employment) ('000)										1970 Projections ('000)	
	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1946-63 Trend	1952-63 Trend
Total Commercial Non-Agriculture	3,746	3,898	4,123	4,262	4,215	4,316	4,345	4,394	4,516	4,661	5,805	5,805
Forestry	91	113	118	105	85	94	97	86	74	81	85	75
Fishing	24	22	20	21	16	15	17	18	23	25	21	19
Mining	102	109	117	118	107	88	93	79	81	72	95	61
Manufacturing	1,326	1,373	1,435	1,492	1,459	1,494	1,470	1,515	1,567	1,614	1,797	1,999
Construction	334	368	412	438	427	442	418	406	429	450	620	583
Utilities	61	62	67	73	78	75	73	77	82	85	127	124
Transportation and Communication	397	403	433	438	429	445	442	432	446	455	551	504
Trade	828	844	882	899	913	946	981	983	1,002	1,019	1,397	1,248
Finance	169	173	194	206	211	216	226	239	248	254	341	365
Recreation	27	28	28	30	32	29	32	33	37	37	47	42
Business Service	63	74	81	93	92	99	102	106	111	120	181	188
Personal Service	326	325	337	352	369	372	394	421	420	452	545	598

For these reasons Labour Force Survey data were also used in the disaggregation of the commercial non-agricultural sector. The annual historical data are shown in Table 2 along with the comparable Census data. The original Census data required extensive disaggregation and subsequent reaggregation in a different way to make them comparable between the various Census years. A graphic comparison of the trends according to Census data with those according to Labour Force Survey data is provided in Figure 2.

The Projection Method

The break-down of the employment projection for the commercial non-agricultural sector into smaller industry divisions was obtained by two statistical operations. In the first operation, the historical relationship in the postwar period of the percentage of commercial non-agricultural employment in each industry sector to time (i.e. the trend) and to overall unemployment was obtained by regression analysis. For each industry sector, a regression analysis was applied to three alternative sets of relationships: (a) percentage employment in the industry as a function of time, (b) percentage employment as a function of time and the overall unemployment rate, and (c) percentage employment as a function of time, the unemployment rate and the squared value of the latter. [6]

[6] These calculations were run on the University of Toronto computer. The material was programmed by Mr. Uri Possen, a graduate student in the Department of Political Economy, University of Toronto.

TABLE 2–B

Percentage Distribution of Commercial Non-Agricultural Employment by Industry, For Canada, 1931 - 61, 1946 - 63 with Projections to 1970

Industry	Census Data (Labour Force)				Labour Force Survey Data (Employment)							
	1931	1941	1951	1961	1946	1947	1948	1949	1950	1951	1952	1953
Total Commercial Non-Agriculture	100.0	100.0	100.0	100.0	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Forestry	4.3	3.5	3.5	2.4	2.78	2.91	2.94	2.05	2.39	3.19	2.61	2.19
Fishing		1.9	1.4	.8	.89	.71	.67	.77	1.14	.83	.75	.69
Mining	3.2	3.5	2.8	2.6	2.45	2.14	2.24	2.50	2.19	2.19	2.48	2.40
Manufacturing	32.0	36.2	36.6	33.0	40.12	39.12	38.44	38.80	38.42	37.42	35.89	36.55
Construction	11.0	8.2	9.4	10.4	7.40	7.77	8.67	9.44	9.66	9.65	9.10	9.16
Utilities	1.1	1.0	1.7	1.6	1.09	1.18	1.24	1.34	1.34	1.41	1.56	1.53
Transportation and Communication	12.2	10.0	10.8	10.1	11.37	11.54	11.25	10.84	10.98	11.03	11.34	11.17
Trade	17.1	17.4	19.1	20.6	18.94	19.72	19.67	19.27	18.80	19.90	21.14	21.55
Finance	4.1	3.4	3.9	5.1	4.10	4.05	4.24	4.29	4.15	4.27	4.36	4.36
Recreation	.8	.7	.8	.9	.76	.84	.85	.86	.85	.80	.86	.74
Business Service	...	.5	1.6	2.7	1.22	1.36	1.39	1.40	1.49	1.50	1.62	1.64
Personal Service	14.2	13.7	8.4	9.8	8.89	8.67	8.40	8.43	8.58	7.82	8.29	8.03
Unemployment Rate					3.4	2.2	2.3	2.8	3.6	2.4	2.9	3.0

Industry	Labour Force Survey Data (Employment)										1970 Projections	
	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1946 - 63 Trend	1952 - 63 Trend
Total Commercial Non-Agriculture	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Forestry	2.43	2.90	2.86	2.46	2.02	2.18	2.23	1.96	1.64	1.74	1.46	1.30
Fishing	.64	.56	.48	.49	.38	.35	.39	.41	.51	.54	.37	.32
Mining	2.72	2.80	2.84	2.77	2.54	2.04	2.14	1.80	1.79	1.54	1.63	1.05
Manufacturing	35.38	35.21	34.80	34.98	34.59	34.62	33.83	34.47	34.67	34.61	30.96	34.43
Construction	8.91	9.44	9.99	10.27	10.12	10.24	9.62	9.24	9.49	9.65	10.68	10.05
Utilities	1.63	1.59	1.62	1.71	1.85	1.74	1.68	1.75	1.81	1.82	2.19	2.13
Transportation and Communication	10.59	10.34	10.50	10.27	10.17	10.31	10.17	9.83	9.87	9.76	9.49	8.68
Trade	22.09	21.65	21.39	21.08	21.65	21.92	22.58	22.37	22.17	21.85	24.06	21.50
Finance	4.51	4.57	4.70	4.83	5.00	5.01	5.20	5.44	5.49	5.45	5.86	6.29
Recreation	.72	.72	.68	.70	.76	.67	.74	.75	.82	.79	.81	.73
Business Service	1.63	1.90	1.96	2.18	2.18	2.29	2.35	2.41	2.46	2.57	3.11	3.23
Personal Service	8.70	8.34	8.17	8.25	8.75	8.62	9.07	9.58	9.29	9.69	9.38	10.30
Unemployment Rate	4.6	4.4	3.4	4.6	7.0	6.0	7.0	7.1	5.9	5.5	3.0	3.0

FIGURE 2

PERCENTAGE DISTRIBUTION OF COMMERCIAL NON-AGRICULTURAL EMPLOYMENT BY INDUSTRY GROUP IN CANADA 1931-1961, 1946-1963, WITH PROJECTIONS TO 1970

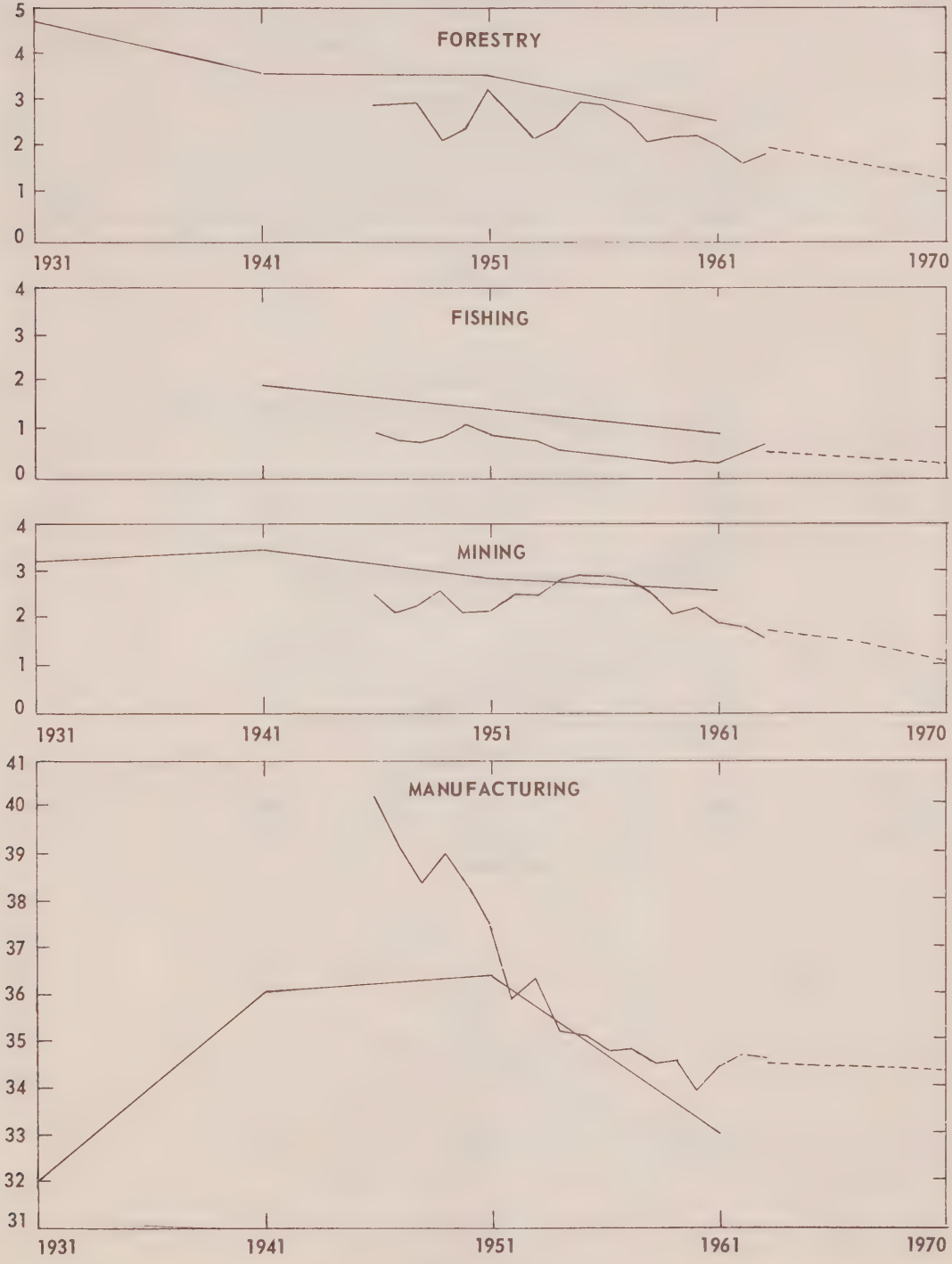


FIGURE 2 cont'd.

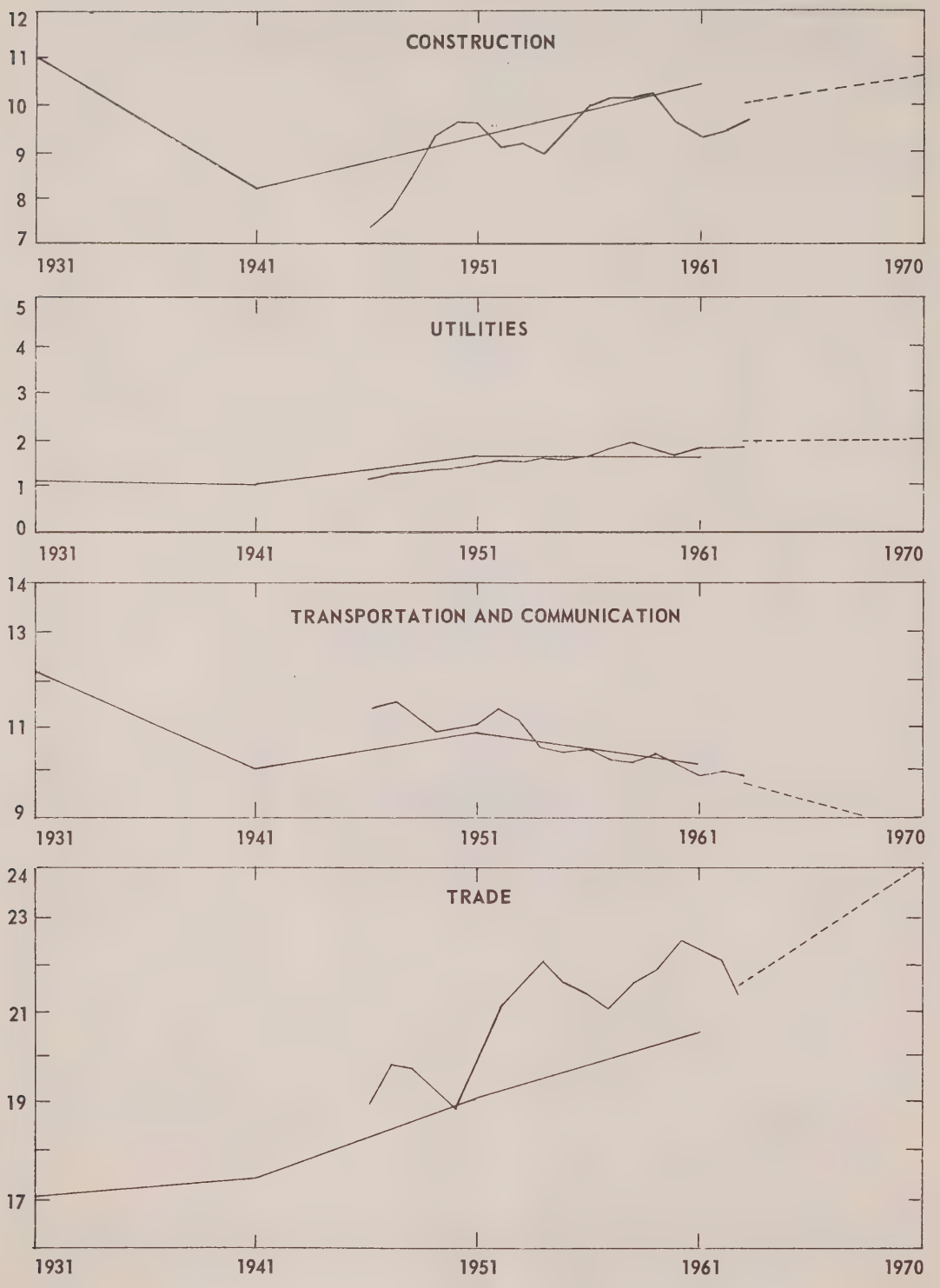
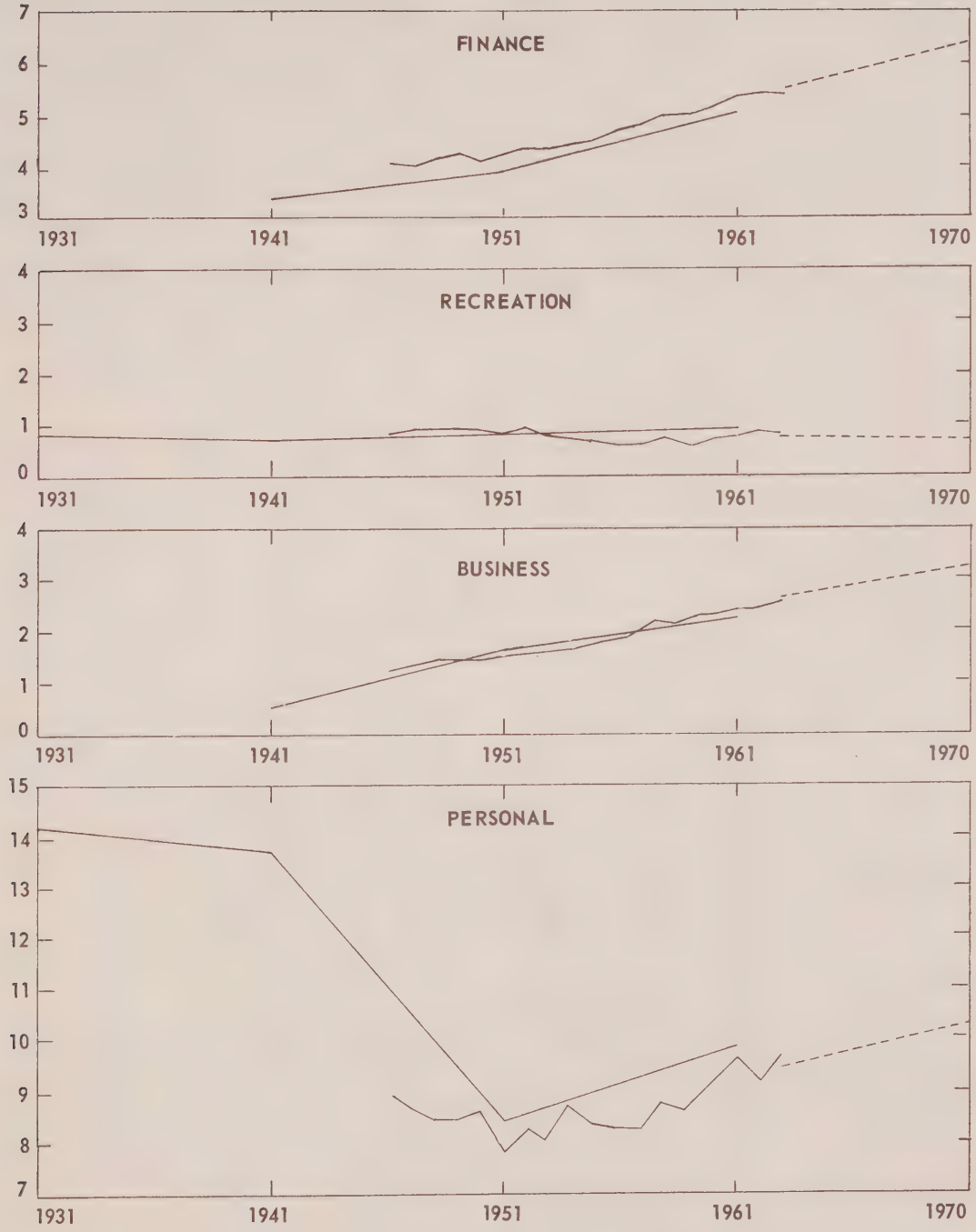


FIGURE 2 cont'd



The historical data, 1946-63, on which the regression analyses are based are given in Table 2. Two alternative time periods were used in the estimation of the relationships of the industry employment percentages to the various combinations of determinants: (i) 1946 to 1963, and (ii) 1952 to 1963. The regression coefficients, the coefficients of determination and the Durbin-Watson measure of interrelatedness for the alternative combinations of determinants and the alternative time periods are given for each industry sector in Table 3.

Once these relationships were determined, the second operation was performed. With the regression coefficients that were obtained in the regression analyses and the assumption that the unemployment rate in 1970 will be 3 per cent, the percentage employment in each industry sector was extrapolated to 1970. The results are given in the second last column in Table 3 and in the last column the percentage extrapolations are converted into absolute numbers.[7]

Of the three combinations of determinants for each industry sector and alternative historical period, one was selected and the corresponding

[7] If the Illing projection of the labour force had been used, each one of the figures in the last column of Table 3 would have been larger by 3.8 per cent.

TABLE 3

Civilian Employment by Industry Sector For Canada, 1946-63, With a Projection to 1970

Industry and period of Analysis	Constant Term	Coefficients			Test of Fit		Selected Equations	Extrapolation of Employment to 1970	
		t	U/L	$(U/L)^2$	R^2	D–W		%	No. ('000)
Forestry	.0296	–.0006	–	–	.41	1.58	x	1.46	85
1946-1963	.0314	–.0003	–.0010	–	.41	1.52		2.07	121
	.0337	–.0003	–.0022	.0001	.37	1.46		2.05	119
1952-1963	.0330	–.0008	–	–	.46	1.20	x	1.30	75
	.0333	–.0008	–.0002	–	.41	1.17		1.27	74
	.0250	–.0009	–.0038	–.0004	.37	1.30		1.03	60
Fishing	.0091	–.0003	–	–	.54	1.07		.16	9
1946-1963	.0096	–.0002	–.0003	–	.53	1.28	x	.37	21
	.0055	–.0003	.0018	–.0002	.55	.97		.16	9
1952-1963	.0082	–.0002	–	–	.37	.44	x	.32	19
	.0088	–.0000	–.0006	–	.57	1.06		.70	41
	.0093	–.0000	–.0009	.0000	.52	1.11		.66	38
Mining	.0257	–.0003	–	–	.05	.47		1.82	106
1946-1964	.0257	–.0003	–.0000	–	.01	.47		1.82	106
	.0128	–.0004	.0066	–.0007	.09	.77	x	1.63	95
1952-1963	.0355	–.0010	–	–	.56	.65	x	1.05	61
	.0350	–.0012	.0006	–	.53	.64		.68	39
	.0200	–.0014	.0077	–.0007	.57	1.05		.18	10
Manufacturing	3946	–.0034	–	–	.84	.69	x	30.96	1797
1946-1963	.3935	–.0036	.0006	–	.83	.71		30.53	1772
	.3951	–.0036	–.0002	.0001	.82	.73		30.54	1773
1952-1963	.3694	–.0016	–	–	.56	1.53		32.94	1912
	.3718	–.0008	.0025	–	.66	1.80	x	34.43	1999
	.3769	–.0007	.0049	.0002	.62	1.85		34.65	2011
Construction	.0843	.0009	–	–	.35	.52	x	10.68	620
1946-1963	.0869	.0013	–.0015	–	.34	.48		11.49	667
	.0826	.0013	.0003	–.0002	.30	.47		11.57	672
1952-1963	.0904	.0004	–	–	–.5	.65	x	10.04	533
	.0903	.0004	.0002	–	–.17	.69		10.09	586
	.0803	.0002	.0049	–.0004	–.28	.75		9.64	560
Utilities									
1946-1963	.0116	.0004	–	–	.89	.87		2.16	125
	.0117	.0004	–.0001	–	.83	.93		2.14	124
	.0107	.0004	.0004	–.0000	.87	1.01	x	2.19	127
1952-1963	.0138	.0003	–	–	.67	1.71	x	2.13	124
	.0136	.0002	.0002	–	.69	1.50		1.92	111
	.0121	.0002	.0009	.0001	.67	1.56		1.89	110

Transportation and Communication	.1159	-.0010	—	—	.87	1.40		9.09	528
1946 - 1963	.1173	-.0008	-.0008	—	.88	1.27	x	9.49	551
	.1226	-.0007	-.0035	.0003	.88	1.40		9.73	565
1952 - 1963	1193	-.0013	—	—	.82	1.17	x	8.68	504
	1199	-.0011	.0006	—	.82	.93		9.06	526
	1349	-.0008	.0078	.0007	.88	1.55		9.78	568
Trade 1946 - 1963	.1905	.0020	—	—	.72	.78		24.05	1396
	.1903	.0020	.0001	—	.71	.78	x	24.06	1397
	.1950	.0021	-.0023	.0002	.69	.71		24.24	1407
1952 - 1963	2082	.0008	—	—	.23	1.16		22.82	1325
	2065	.0001	.0021	—	.38	1.09	x	21.50	1248
	2086	.0001	.0009	.0001	.30	1.10		21.47	1246
Finance	.0382	.0009	—	—	.93	.67		6.07	352
1946 - 1963	.0373	.0007	.0005	—	.94	.77		5.63	327
	.0413	.0008	-.0015	.0002	.94	.88	x	5.86	341
1952 - 1963	.0347	.0011	—	—	.97	1.75		6.22	361
	.0345	.0011	.0003	—	.97	1.53	x	6.29	365
	.0387	.0011	.0013	.0002	.98	2.06		6.26	363
Recreation	.0082	-.0001	—	—	.11	.93		1.01	59
1946 - 1963	.0084	-.0000	-.0001	—	.07	1.05	x	.81	47
	.0104	-.0000	-.0011	.0001	.15	1.36		.80	46
1952 - 1963	.0073	.0000	—	—	-.19	1.10	x	.73	42
	.0074	.0000	.0001	—	-.29	1.32		.71	41
	.0102	.0001	.0014	.0001	-.25	1.70		.94	55
Business Service	.0109	.0008	—	—	.97	.91		3.09	179
1946 - 1963	.0105	.0008	.0002	—	.97	1.21	x	3.11	181
	.0114	.0008	-.0002	.0000	.97	1.32		3.08	179
1952 - 1963	.0096	.0009	—	—	.96	1.39		3.21	186
	.0095	.0009	.0001	—	.96	1.53	x	3.23	188
	.0090	.0009	.0003	.0000	.96	1.50		3.24	188
Personal Service	.0813	.0005	—	—	.23	.86	x	9.38	545
1946 - 1963	.0775	-.0000	.0022	—	.36	.57		8.41	488
	.0790	-.0000	.0014	.0001	.31	.59		8.41	488
1952 - 1963	.0705	.0013	—	—	.69	1.66	x	10.30	598
	.0699	.0011	.0006	—	.67	1.36		9.92	576
	.0750	.0012	.0018	.0002	.64	1.43		10.14	589

extrapolation considered at the appropriate projection. The selection was made in a discretionary manner by applying the following three criteria: 1) maximizing the correlation coefficient, 2) obtaining a Durbin-Watson statistic as close to 2 as possible, and 3) ensuring the reasonableness of the projection on the basis of comparisons with the trend in the corresponding Census data and intuitive judgments. At the same time, the selected extrapolations had to meet the constraint of adding up to 100 per cent. They are indicated by "X" in Table 3 and compiled in Table 2. In Figure 2, only the 1952-63-70 projections are represented.

The Projection Results and Evaluation

Of the two sets of projections it was decided to use the one based on the 1952-63 trends because they would not be affected by any possible distortions in the immediate postwar years due to the change-over from a war-time to a peace-time economy and they would better reflect more recent developments.[8] In some of the industries, considerable discrepancies occur between the two projections. The 1952-63-70 projection is significantly higher for manufacturing and considerably lower for trade than the 1946-63-70 projection. In relative terms, it is also noteworthy that the 1952-63-70 projection involves a significant decline for employment in mining between 1963 and 1970 while the 1946-63-70 projection implies a sharp increase. These discrepancies indicate that the trends are by no means unambiguous and that the 1952-63-70 projections must be used with caution.[9]

Furthermore, it should be noted that these trend projections do not take account of the manpower implications of the investment requirements to fulfil the output target of the Economic Council. If a projection method had been used in which the industry structure of output was first determined and

[8] Another reason for not using the 1946 to 1963 trends concerns the reliability of the earlier data. The Labour Force Survey was first introduced in 1946, and some statisticians believe the employment data by industry for the first few years are not as reliable as those obtained later, especially after 1952, when the survey changed from a quarterly to a monthly basis.

[9] As a matter of fact, in the case of mining, not only is the 1946-63-70 projection probably much closer to the likely employment in 1970 than the significantly lower 1952-63-70 projection, but according to a study by Mr. V. K. Comar ("Manpower Requirements in the Mining Industry in Canada in 1970", Department of Manpower and Immigration, 1967, unpublished) the 1946-63-70 projection is still only about two-thirds of the employment which the more sophisticated projection of the Comar study indicates.

adjusted to include the construction and manufacturing components of the investment requirements, it is very likely that, in the resulting projection of manpower requirements by industry, construction would have been considerably higher and manufacturing somewhat higher than in the above trend projection.

Nevertheless, the projection does indicate the general outlook for the future development of manpower requirements by industry. Thus, manpower requirements in public utilities, finance and business service, community service and public administration (government) are growing faster than overall employment, and the increase of the construction sector will probably be no less than that for all industries. Manufacturing and transportation and communication, on the other hand, are not likely to significantly exceed the aggregate growth rate and all indications point to a decline in agriculture's and forestry's share of total employment. In the case of the other industries, the evidence is more ambiguous.

CHAPTER III

OCCUPATION STRUCTURE

The occupation structure of employment has been derived by projecting the trend in the percentage occupation structure in each industry and applying it to the projections of the industry structure of employment obtained in the previous section. This involved some important data probblems.

The Data

In this stage of the projections, decennial Census data rather than Labour Force Survey data were used. This change in data sources was necessary because only the Census provides complete cross-tabulations of occupations by industries. The Labour Force Survey data contain sampling errors which are too large to ensure sufficient reliability at the level of detail that such a cross-tabulation requires.

As in the case of the industry breakdown of the Labour Force data in the Census, extensive work also had to be devoted to making the occupation distribution comparable as between 1931, 1941, 1951 and 1961. The basis for comparability consisted of the industry and occupation classification systems used in the 1951 Census. In adjusting the occupation data, not only did the occupation groups have to be broken down and and then re-grouped according to the 1951 classification, but some of the occupation classes had to be disaggregated according to the industries involved and the worker status of the persons.

Two residual categories, "industry unspecified" and "occupation not stated", had to be given special consideration. Since they are meaningless in terms of manpower requirements, they were excluded from the percentage distributions of employment by industries and by occupations.[1] This implies that it is assumed that the breakdown of "industry unspecified" group corresponds to the percentage distribution of the specified industries, so that the unspecified group could be proportionately distributed among the specified industries. Similarly, the above method contains the implicit assumption that the composition of the "occupation not stated" group is such that it can be proportionately distributed among the stated occupation groups. Since there is no further information in this respect, these assumptions are as good as any other and more convenient.

The Projection

The projected 1970 structure of occupation groups in each industry is the extrapolation of the trend of the percentage distribution in the industry in the years 1931, 1941, 1951 and 1961. Because there are only these four sets of historical observations, the type of regression analysis used in the projection of the industry structure of employment could not be applied at this stage of the projections. Instead, the extrapolations were made in a discretionary manner using as informal criteria, first, the minimization of the deviations of the observed data from the linear trends to be projected and, secondly, the consideration of special factors in certain industries. In addition there was the constraint that the projections for all the occupation groups had to add up to 100 per cent in each industry sector.

This approach does not directly allow for the cyclical sensitivity of the industries' occupation structures of employment, as the regression analysis in the previous stage did for the cyclical sensitivity of the industry structure of employment by including the overall unemployment rate in the regression equation. To reduce this problem, the percentage occupation structure of the labour force in each industry was used as a proxy for the cyclically adjusted occupation structure of employment in the industry. This is justified on the basis of the fact that the structure of the labour force is cyclically less sensitive than the structure of employment.

On the other hand this improvement brings up the problem of persistent inter-occupational unemployment differentials. This means that the projections will involve slight overestimates for occupation groups which experience more than 3 per cent unemployment when the overall average is such, and underestimates for occupation groups with lower unemployment.

The observed percentage occupation structures by industry in the past, as well as the projections to 1970, are given in Table 4. The projected percentage occupation structure in each industry was

[1] For this reason the percentage occupation structures of each industry are not quite the same as those shown in *Manpower in Canada, 1931 to 1961—Historical Statistics of the Canadian Labour Force*, by Noah M. Meltz, published by the Department of Manpower and Immigration.

TABLE 4

Percentage Distribution of Labour Force[1] in Each Industry among Occupation Groups, 1931-61, and Projected to 1970

Industry / Occupation	Agriculture					Forestry					Fishing[2]				Mining				
	1931	1941	1951	1961	1970	1931(a)	1941	1951	1961	1970	1941	1951	1961	1970	1931	1941	1951	1961	1970
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Managerial	—	.01	.03	.27	.50	1.93	1.51	3.63	4.06	5.00	.11	.48	1.19	2.00	1.66	1.47	2.66	3.33	4.00
Professional	.03	.05	.19	.22	.30	.40	.58	.98	1.44	2.00	.18	.84	2.18	4.00	2.38	3.30	5.22	8.09	10.25
Clerical	.03	.03	.13	.24	.30	.56	1.28	2.28	2.43	3.05	.09	.35	.65	1.00	1.78	2.15	4.18	6.72	8.75
Commercial and Financial	.02	.01	.14	.31	.45	.05	.06	.17	.22	.30	.08	.38	.42	.55	.18	.11	.61	.88	1.00
Manufacturing	.02	.02	.07	.13	.20	2.07	4.18	5.14	6.90	8.00	.24	.65	.96	1.25	8.21	9.42	12.79	16.77	20.00
Construction	.01	.01	.12	.12	.15	.11	.20	1.12	.95	1.00	.05	.14	.22	.30	2.68	3.15	4.58	4.54	4.75
Labourers	.01	.04	.13	.25	.40	.31	.92	2.60	4.77	6.75	.20	.56	.92	1.25	1.38	1.69	3.97	3.58	3.50
Transportation and Communication	.04	.08	.17	.27	.45	1.34	4.97	6.47	8.42	10.45	.69	.92	1.32	1.75	1.90	1.63	3.92	4.71	5.50
Service	.03	.02	.22	.19	.20	3.06	4.01	4.93	4.13	4.25	.47	1.20	2.09	2.90	1.32	2.16	2.33	2.34	2.45
Agricultural	99.81	99.73	98.72	97.93	97.25	.06	—	.52	.69	.50	.19	.04	.05	.05	.02	.03	.11	.10	.10
Fishing	...	...	...	.01	...	47.98	.05	.04	.13	.10	97.70	94.41	89.78	84.75	.02	...	...	.02	.02
Logging	...	...	.08	.06	...	42.12	82.22	72.04	65.77	58.50	—	.03	.21	.20	.07	.02	.05	.06	.05
Mining	...	...	...	...	...	.01	.02	.08	.09	.10	—	...	.01	...	78.40	74.87	59.58	48.86	29.63

Industry / Occupation	Manufacturing					Construction					Public Utilities					Transportation and Communication				
	1931	1941	1951	1961	1970	1931	1941	1951	1961	1970	1931	1941	1951	1961	1970	1931	1941	1951	1961	1970
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Managerial	5.15	2.93	5.27	6.37	7.50	5.14	3.08	6.47	8.22	9.50	3.83	3.83	4.23	5.56	6.50	4.23	2.69	4.13	5.08	6.00
Professional	2.26	2.94	3.45	5.12	6.95	1.41	1.90	1.64	2.29	3.00	8.29	9.16	7.30	10.00	11.00	1.56	1.97	1.75	3.76	5.50
Clerical	8.45	8.80	11.04	12.23	13.30	1.42	1.52	3.16	3.98	4.75	14.66	14.46	15.95	20.58	22.00	10.86	10.10	11.89	14.40	15.50
Commercial and Financial	5.35	3.32	4.84	6.71	8.00	.09	.05	.41	.65	.95	4.78	3.80	1.34	1.92	2.25	2.46	2.19	1.89	1.27	1.25
Manufacturing	53.43	61.30	53.54	50.75	47.30	4.16	3.34	6.80	12.67	17.65	19.94	25.10	19.33	20.77	21.75	3.10	4.77	5.55	5.46	5.50
Construction	4.17	3.95	3.92	3.31	3.25	53.70	63.84	53.93	46.53	40.30	17.77	15.67	8.70	8.66	8.50	2.13	1.69	1.98	2.90	3.00
Labourers	17.83	13.31	12.12	8.29	5.25	30.58	22.73	20.89	17.97	15.25	18.74	12.23	21.79	11.09	7.35	12.41	8.92	7.48	5.85	4.50
Transportation and Communication	2.23	2.05	3.22	4.62	5.75	2.31	2.71	5.02	5.94	6.75	9.11	10.41	16.31	17.12	17.25	60.27	64.12	61.52	57.32	54.35
Service	.97	1.24	1.79	1.76	1.85	.81	.52	1.02	.95	1.00	2.72	5.08	4.46	3.27	3.00	2.83	3.50	3.70	3.74	4.25
Agricultural	.02	.02	.08	.10	.10	.03	.02	.06	.08	.05	.13	.11	.31	.57	.15	.04	.03	.07	.09	.08
Fishing	.03	.01	.18	.17	.15	—	—	...	...	...	.01	...	—	.03	...	...	.01	...	.02	...
Logging	.10	.12	.46	.42	.40	.01	.01	.07	.06	.05	.01	.14	.14	.15	.15	...	.01	.03	.02	.02
Mining	.01	.01	.09	.15	.20	.34	.28	.53	.66	.75	.01	.01	.14	.28	.10	.01	...	.01	.09	.05

Table 4 (cont'd.)

Industry / Occupation	Trade					Finance					Community Service					Business Service[3]			
	1931	1941	1951	1961	1970	1931	1941	1951	1961	1970	1931	1941	1951	1961	1970	1941	1951	1961	1970
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Managerial	28.95	27.69	25.35	22.14	21.50	9.26	9.19	11.06	12.80	14.00	.21	.25	.12	.06	.20	.64	.69	1.47	1.75
Professional	1.23	2.28	1.81	1.63	1.75	3.72	6.69	4.61	3.41	4.00	74.92	74.16	64.04	59.80	57.00	41.60	48.46	44.02	43.00
Clerical	12.66	13.44	16.57	17.53	18.50	51.93	44.82	52.67	52.21	51.55	6.84	5.25	6.44	8.10	9.50	30.99	33.53	37.49	38.00
Commercial and Financial	39.90	37.63	31.85	32.48	30.30	32.24	26.18	22.92	23.27	22.00	1.35	.13	.28	.35	.45	21.11	5.92	4.60	4.50
Manufacturing	5.73	5.97	9.63	11.87	13.00	.26	.83	.90	.87	.85	1.46	1.80	3.01	2.45	2.75	1.32	2.56	1.70	1.75
Construction	.62	.44	1.35	1.33	1.50	.11	.12	.44	.47	.45	.49	.31	1.14	1.14	1.15	.99	1.50	1.64	1.75
Labourers	2.88	2.91	4.10	4.60	5.00	.09	.22	.29	.19	.20	.80	.55	1.05	.67	.75	.57	1.53	1.34	.85
Transportation and Communication	7.22	8.79	7.10	6.10	6.00	1.95	1.60	1.56	1.19	1.15	.42	.37	.87	1.09	1.25	1.02	1.37	2.02	2.25
Service	.79	.79	1.93	2.06	2.25	1.43	10.33	5.50	5.54	5.75	13.09	16.90	22.31	25.82	26.50	1.74	4.26	5.52	6.00
Agricultural	.02	.05	.18	.14	.10	.01	.02	.05	.05	.05	.40	.28	.72	.51	.45	—	.10	.08	.08
Fishing	...	...	.07	.04	.13	—	—	...	...	...	...	...	.02	.01	...	—	—	.02	...
Logging	...	.01	.05	.05	.05	...	—	...	...	...	.01	...	...	...	...	.01	.02	.01	.01
Mining	...	...	.01	.03	.02	—	...	...	...	...	.01	...	...	...	...	.01	.06	.09	.06

Industry / Occupation	Government					Recreation					Personal Service				
	1931	1941	1951	1961	1970	1931	1941	1951	1961	1970	1931	1941	1951	1961	1970
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Managerial	8.32	12.37	12.15	9.07	9.50	26.26	19.26	23.14	17.96	18.00	5.87	5.83	12.79	11.65	10.75
Professional	6.99	9.16	8.67	11.44	13.45	15.31	16.14	7.58	6.88	7.00	1.14	1.14	1.42	1.11	1.15
Clerical	30.49	34.10	35.22	31.03	30.50	8.93	11.39	12.66	11.79	11.50	2.15	2.11	3.92	3.91	3.90
Commercial and Financial	1.29	1.17	1.08	1.12	1.10	1.64	1.71	3.51	3.96	4.25	.93	1.10	1.17	1.28	1.30
Manufacturing	2.52	2.86	5.50	6.46	7.00	1.32	1.18	3.04	3.87	4.45	.83	.74	1.69	1.69	1.70
Construction	2.09	1.29	4.50	4.44	4.50	1.06	.67	1.21	1.26	1.25	.11	.07	.64	.63	.60
Labourers	15.95	8.62	6.24	8.59	6.50	10.96	8.17	4.00	3.44	3.00	1.11	.92	1.87	1.38	1.25
Transportation and Communication	12.74	8.32	7.39	7.80	7.50	.89	.82	.92	.80	.75	1.87	1.26	1.82	2.06	2.25
Service	18.52	21.05	17.83	17.97	18.00	32.63	39.84	38.63	41.72	41.50	84.84	85.97	73.15	75.38	75.65
Agricultural	.93	.79	1.22	1.79	1.75	.70	.60	4.45	7.92	8.00	.97	.50	1.02	.96	.95
Fishing	.02	.02	.04	.03	.02	.29	.21	.84	.38	.30	.18	.36	.51	.54	.50
Logging	.13	.24	.11	.19	.13	.01	.01	.02	.01	...	...	...	...	.01	...
Mining	.01	.01	.05	.07	.05	—	—	—	.01	...	...	...	—	...	...

[1] Percentages are based on labour force in each industry excluding persons in the occupational group "Not Stated". "..." indicates that the proportion is too small to be significant.

[2] In 1931, fishing is included in foresty.

[3] In 1931, business service is included in community service.

(a) Including fishing.

(b) Including business service.

Source: *Manpower in Canada, 1931 to 1961, Historical Statistics of the Canadian Labour Force* by Noah M. Meltz, published by the Department of Manpower and Immigration.

then applied to the two alternative employment projections for the industry, i.e. the 1946-63-70 extrapolation and the 1952-63-70 extrapolation. The two resulting sets of projections of the occupation structures in each industry in absolute numbers, together with the corresponding aggregated occupation structures, are presented in Table 5.

Summary of Results

To put these projections into the context of the observed year-by-year developments in the occupational composition of total employment during the postwar period, these data are presented in Table 6 and included in Figure 3. The historical data are derived from the Labour Force Survey. The graphic presentation indicates that the projections are generally in accordance with the trends indicated by the Labour Force Survey data. It also appears from Table 6 that the B projections of the percentage occupation structure of employment coincides somewhat more closely with these trends than the A projections. However in the occupation stage of the projections, the difference between A and B is less significant than at the industry stage.

TABLE 5

Projections[1] of Employment to 1970, Occupation Group by Industry Group ('000)

Occupation / Industry	Managerial		Professional		Clerical		Commercial and Financial		Manufacturing		Construction		Labourers	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B
Total	720	700	968	977	1,183	1,186	689	666	1,308	1,368	407	395	358	352
Agriculture	3	3	2	2	2	2	2	2	1	1	1	1	2	2
Forestry	4	4	2	2	2	2	...	...	7	6	1	1	6	5
Fishing	1	...	1	1	...	...	...	...	...	...	...	...	...	...
Mining	4	2	10	6	8	5	1	1	19	12	5	3	3	2
Manufacturing	135	150	125	139	239	266	144	160	850	946	58	65	94	105
Construction	59	55	19	18	30	28	6	6	109	103	250	235	95	89
Utilities	8	8	14	14	28	27	3	3	28	27	11	11	9	9
Transportation and Communication	33	30	30	28	85	78	7	6	30	28	17	15	25	23
Trade	300	268	25	22	259	231	423	378	182	162	21	19	70	62
Finance	48	51	14	15	176	188	75	80	3	3	1	2	1	1
Community Service	2	2	566	566	94	94	5	5	27	27	11	11	8	8
Business Service	3	3	78	81	69	72	8	9	3	3	3	3	2	2
Government	52	52	73	73	165	165	6	6	38	38	24	24	35	35
Recreation	9	8	3	3	5	5	2	2	2	2	1	1	2	1
Personal Service	59	64	6	7	21	23	7	8	9	10	3	4	7	8

Occupation / Industry	Transportation and Communication		Service		Agricultural		Fishing		Logging		Mining		All Occupations	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B
Total	640	611	928	965	555	554	24	22	59	54	47	32	7,883	7,883
Agriculture	2	2	1	1	528	328	...	...	...	...	...	...	543	543
Forestry	9	8	4	3	...	...	...	...	50	44	...	...	85	75
Fishing	...	...	1	1	...	...	18	16	...	...	...	...	21	19
Mining	5	3	2	2	...	...	...	...	...	...	38	24	95	61
Manufacturing	103	115	33	37	2	2	3	3	7	8	4	4	1,797	1,997
Construction	42	39	6	6	...	...	...	...	...	...	5	4	620	583
Utilities	22	21	4	4	...	...	...	...	...	...	...	...	127	124
Transportation and Communication	300	274	23	21	1	...	...	...	...	...	...	...	551	504
Trade	84	75	31	28	1	1	...	...	1	1	...	...	1,397	1,248
Finance	4	4	19	21	...	...	...	...	...	...	...	...	341	365
Community Service	12	12	263	263	5	5	...	...	...	...	...	...	993	993
Business Service		4	11	11	...	...	...	...	...	...	...	...	181	188
Government	41	41	98	98	9	9	...	...	1	1	...	...	542	542
Recreation	...	...	20	17	4	3	...	...	...	...	...	...	47	42
Personal Service	12	13	412	452	5	6	3	3	...	...	...	...	545	598

[1] The A-projections are based on the 1946-63-70 projections of the industry structure of employment and the projected percentage industry-occupation structure in Table 4, and the B-projections are based on the 1952-63-70 projections of the industry structure of employment and the same projection of the industry-occupation structure as in the A-projections.

FIGURE 3

PERCENTAGE DISTRIBUTION OF TOTAL EMPLOYMENT BY OCCUPATION GROUP IN 1931-1961, 1948-1963 WITH PROJECTION (B) TO 1970.

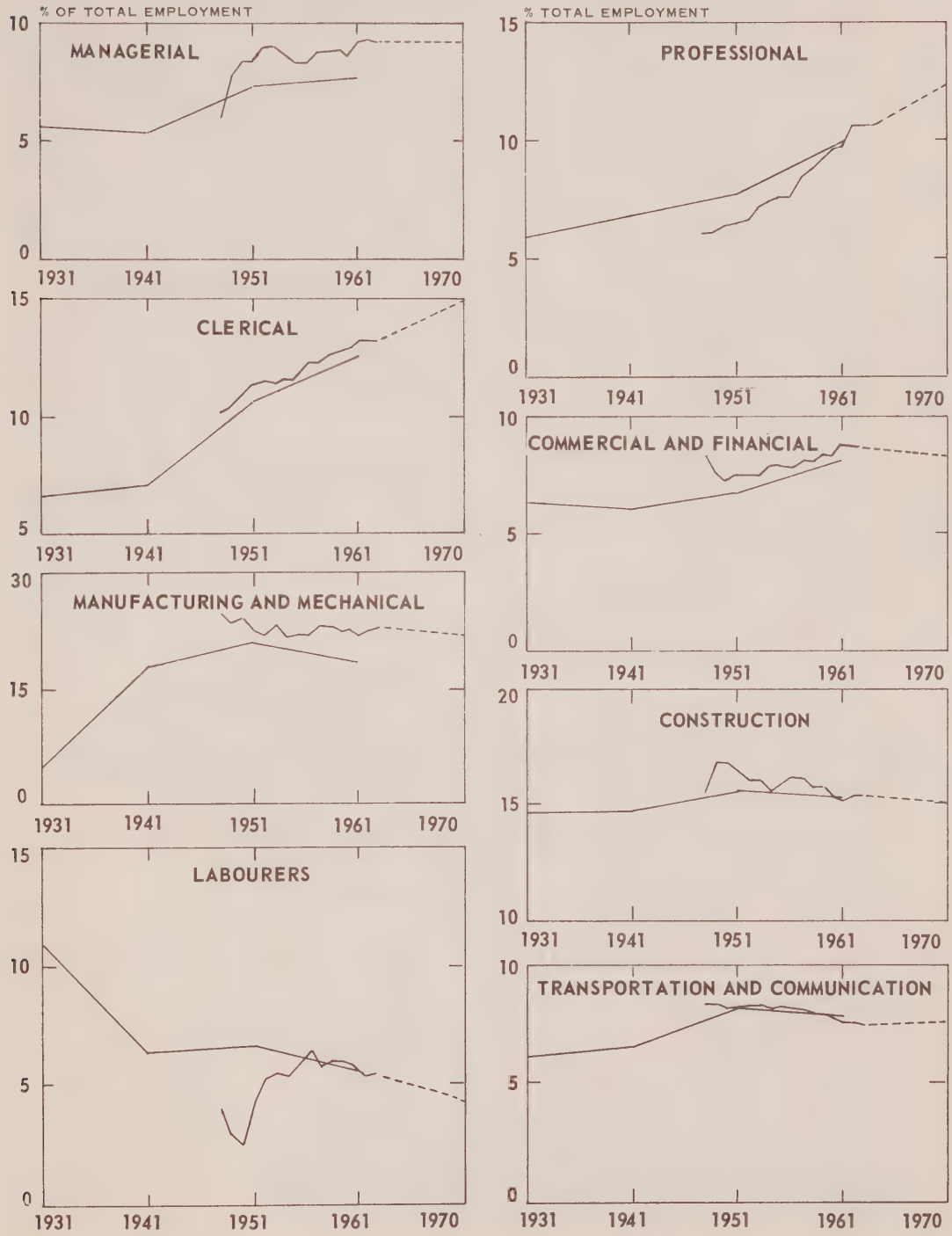


FIGURE 3 (cont'd)

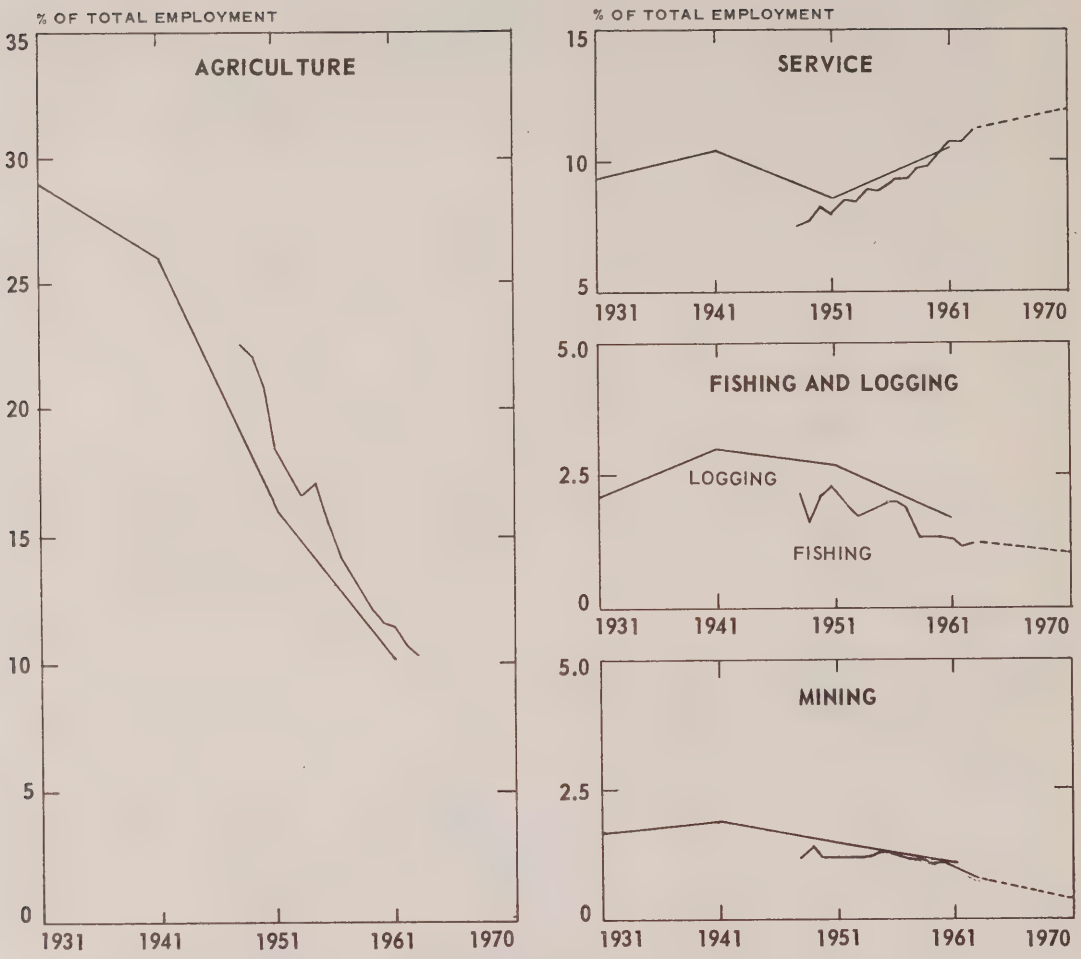


TABLE 6

Distribution of Total Employment by Occupation Group, for Canada, 1948-63, with Projections to 1970
Numerical Distribution
('000)

OCCUPATION GROUP	ACTUAL																Projections to 1970	
	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	A	B
All Occupations	4,875	4,913	4,976	5,097	5,159	5,235	5,243	5,364	5,585	5,725	5,695	5,856	5,955	6,049	6,217	6,364	7,883	7,883
Managerial	295	384	409	424	458	477	455	448	464	496	501	521	520	551	570	576	720	700
Professional	288	295	316	326	335	371	383	408	427	483	502	543	578	591	652	667	968	977
Clerical	499	511	542	582	595	594	606	626	684	705	716	735	764	795	819	843	1,183	1,186
Commercial and Financial	411	358	347	370	380	386	397	413	427	447	451	487	493	507	515	529	689	666
Manufacturing and Mechanical	896	878	907	898	891	925	900	927	971	1,014	1,000	1,021	1,041	1,034	1,086	1,124	1,308	1,368
Construction Trades	269	328	331	319	307	310	288	304	328	335	322	329	319	315	332	338	407	395
Labourers	195	154	128	239	269	289	283	320	359	340	329	344	337	327	325	334	358	352
Transportation and Communication	406	409	405	414	424	430	419	442	454	461	459	466	470	463	466	474	640	611
Service	361	374	409	402	448	444	465	474	506	524	551	574	607	658	675	708	928	965
Agricultural	1,095	1,082	1,023	945	891	863	885	826	784	750	714	694	677	678	656	649	555	554
Fishing and Logging	105	80	107	127	105	91	97	107	111	103	83	89	92	82	75	83	83	74
Mining	56	62	54	54	60	57	66	69	71	68	65	53	58	48	46	41	47	32

OCCUPATION GROUP	ACTUAL																	
	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	A	B
All Occupations	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Managerial	6.1	7.8	8.2	8.3	8.9	9.1	8.7	8.3	8.3	8.7	8.8	8.9	8.7	9.1	9.2	9.1	9.1	8.9
Professional	5.9	6.0	6.3	6.4	6.5	7.1	7.3	7.6	7.6	8.4	8.8	9.3	9.7	9.8	10.5	10.5	12.3	12.4
Clerical	10.2	10.4	10.9	11.4	11.5	11.3	11.5	11.7	12.3	12.3	12.6	12.6	12.8	13.1	13.2	13.2	15.0	15.0
Commercial and Financial	8.4	7.3	7.0	7.3	7.4	7.4	7.6	7.7	7.6	7.8	7.9	8.3	8.3	8.4	8.3	8.3	8.7	8.4
Manufacturing and Mechanical	18.4	17.9	18.2	17.6	17.3	17.7	17.2	17.3	17.4	17.7	17.6	17.4	17.5	17.1	17.5	17.7	16.6	17.4
Construction Trades	5.5	6.7	6.7	6.3	5.9	5.9	5.5	5.7	5.9	5.8	5.6	5.6	5.3	5.2	5.3	5.3	5.2	5.0
Labourers	4.0	3.1	2.6	4.7	5.2	5.5	5.4	6.0	6.4	5.9	5.8	5.9	5.7	5.4	5.2	5.3	4.5	4.5
Transportation and Communication	8.3	8.3	8.1	8.1	8.2	8.2	8.0	8.2	8.1	8.1	8.1	8.0	7.9	7.6	7.5	7.4	8.1	7.8
Service	7.4	7.6	8.2	7.9	8.7	8.5	8.9	8.8	9.1	9.2	9.7	9.8	10.2	10.9	10.9	11.1	11.8	12.2
Agricultural	22.5	22.0	20.6	18.5	17.3	16.5	16.9	15.4	14.0	13.1	12.5	11.8	11.4	11.2	10.5	10.2	7.0	7.0
Fishing and Logging	2.2	1.6	2.1	2.4	2.0	1.7	1.8	2.0	2.0	1.8	1.5	1.5	1.5	1.4	1.2	1.3	1.1	0.9
Mining	1.1	1.3	1.1	1.1	1.1	1.1	1.2	1.3	1.3	1.2	1.1	.9	1.0	.8	.7	.6	0.6	.4

Source: D.B.S. Labour Force Survey and Table 5.

TABLE 7

Comparison of the Change in the Overall Occupation Structure Induced by (1) Change in the Industry Structure(a) and (2) Change in the Industries' Occupation Structures(b)

Occupation Group		1961[e]	1970[f]	1970 Industry Structure with 1961 Occupation Structure	1961 Industry Structure with 1970 Occupation Structure	Absolute Changes in the Percentage Distribution		
						Total(c)	Due to Changes in	
							The Industry Structure	The Occupation Structure
					Per Cent			
Managerial	(A)	8.3	9.1	8.7	8.8	0.8	0.4	0.5
	(B)		8.9	8.4		0.6	0.1	
Professional	(A)	9.9	12.3	11.8	10.6	2.4	1.9	0.7
	(B)		12.4	11.9		2.5	2.0	
Clerical	(A)	13.4	15.0	14.3	14.1	1.6	0.9	0.7
	(B)		15.0	14.3		1.6	0.9	
Commercial and Financial	(A)	8.4	8.7	8.8	8.3	0.3	0.4	−0.1
	(B)		8.4	8.5		0.0	0.1	
Manufacturing and Mechanical	(A)	17.3	16.6	16.7	17.1	−0.7	−0.6	−0.2
	(B)		17.4	17.6		0.1	0.3	
Construction	(A)	5.1	5.2	5.6	4.7	0.1	0.5	−0.4
	(B)		5.0	5.4		−0.1	0.3	
Labourers	(A)	5.5	4.5	5.6	4.4	−1.0	0.1	−1.1
	(B)		4.5	5.6		−1.0	0.1	
Transportation and Communication	(A)	7.9	8.1	8.0	8.1	0.2	0.1	0.2
	(B)		7.8	7.6		−0.1	−0.3	
Service	(A)	10.7	11.8	11.5	10.9	1.1	0.8	0.2
	(B)		12.2	12.0		1.5	1.3	
Agricultural	(A)	11.3	7.0	7.1	11.2	−4.3	−4.2	−0.1
	(B)		7.0	7.1		−4.3	−4.2	
Fishing	(A)	0.4	0.3	0.3	0.3	−0.1	−0.1	−0.1
	(B)		0.3	0.3		−0.1	−0.1	
Logging	(A)	1.1	0.8	0.9	1.0	−0.3	−0.2	−0.1
	(B)		0.7	0.8		−0.4	0.3	
Mining	(A)	0.7	0.6	0.7	0.6	−0.1	0	−0.1
	(B)		0.4	0.5		−0.3	−0.2	
Total[d]	(A)	100.0	100.0	100.0	100.0	—	—	—
	(B)		100.0	100.0				

(a) Industry projection 1946-63-70, based on Labour Force Survey data.
(b) Industry projection 1952-63-70, based on Census data.
(c) The two components of change may not add up to the total change because of rounding errors and the interraction of the two sources of change, i.e., $\Delta a\,\Delta b$ in $\Delta ab = a_o\,\Delta b + \Delta b_o\,\Delta a . \Delta a \Delta b$.
(d) The vertical additions may not amount to precisely 100 per cent in the first four columns and 0 per cent in the last three columns due to rounding errors.
(e) Based on decennial census data excluding the occupation group Not Stated.
(f) See Table 6.

The sharpest increase in manpower requirements is projected for the professional occupations. The projected increases for the clerical and service occupations are also significant. The number of labourers is projected to remain unchanged from the 1963 level, while all the primary occupations are characterized by significant declines.[2]

In Table 7 it can be seen to what extent these changes are due to changes in the industry structure and to what extent they are attributable to changes in the industries' occupation structures. The projected increase in employment opportunities for professional occupations is largely due to its concentration in rapidly growing industries, particularly business and community service and public administration and utilities. But there is also a significant shift in the occupation structures of most industries toward professional occupations. The increase in the service occupations is attributable to the shifts in the industry structure to an

[2] For an analysis of the historical impact and the occupation composition of the labour Force of changes in the industrial distribution of output, output per person in industry sectors and occupational structures of industries see: Noah M. Meltz, *Changes in the Occupational Composition of the Canadian Labour Force*, Occasional Paper No. 2, Department of Labour (Queen's Printer, Ottawa, 1965), pp. 71-79.

even greater extent (i.e., shifts toward the community, public and personal service industries). In the case of the clerical occupations, however, the increase is as much due to their increasing utilization by all industries as it is to the more rapid growth of industries with high concentrations of clerical occupations. It should be noted that the rising historical trend of the proportion of persons in clerical occupations in the respective industries has coincided with a decline in relative wages (i.e., average earnings in the occupation as per cent of the average for all occupations)[3]. The trend projection of employment thus implies a continuation of the trend in relative wages. Since the past decline in relative wages has been largely due to increases in the female labour force, the projection further implies the continuation of such increases. Incidentally, this case serves as a useful illustration of the problem for the making of projections as a result of the feedback from manpower supplies to manpower requirements through the price mechanism.

The decline in the primary occupations is mostly due to a shift away from the primary industries. A small part of it, though, is also due to a minor shift away from the utilization of primary occupations in these industries. The relative decline of labourers, on the other hand, is entirely attributable to a sharp reduction of the labourer component in the industries' occupation structures, particularly those of the secondary industries.

The trends of the other occupation groups either follow the growth of overall employment or are not sufficiently consistent to make meaningful statements about them. In the case of managerial occupations there are serious data discrepancies (see Figure 3). If we use Labour Force Survey data, an approximately constant proportion of managers in employment is projected (see Table 6). If, on the other hand, we use only the industry structure of the Labour Force Survey and use Census data for the respective industries occupation structures, a growth of managerial employment opportunities of more than that of total employment is indicated (see Table 7). In the latter instance, the change is largely explained by a significant increase in the managerial component in every industry division except trade and personal service.

The projections for the manufacturing and mechanical, construction, transportation and communication, and commercial and financial occupation groups indicate a growth approximately commensurate with the growth of overall employment. Minor declines in the manufacturing and commercial components in the occupation structures are more or less balanced by the relatively more rapid growth of the industries in which those occupations are concentrated (with the exception of the A projection for manufacturing occupations). For the transportation and communication occupations it is the reverse. Construction occupations are projected to experience a relatively sharp decline in their utilization relative to other occupations within the construction industry, which, however, is made up for by the relatively rapid growth that has been projected for the construction industry.

In summary, the most outstanding characteristics of the projections of the occupation groups are the relative increases of professional and clerical workers, the rapid growth of the industries intensively using service occupations, the increasing relative utilization of managers in nearly all industry divisions, the declining relative use of labourers in the secondary industries, and the contraction of employment opportunities in the primary industries.

[3] Ibid., pp. 61-8.

CHAPTER IV

EDUCATION STRUCTURE

Two alternative methods have been used in projecting the manpower requirements by educational levels. The first method consists of extrapolating the observed trends in the percentage structure of educational qualifications in each occupation group and applying the projected structure to the occupation projections in Table 5. The second method involves the disaggregation of the occupation groups into occupation classes, the determination of the required entrants in 1961-70 by occupation classes and the specification of the educational qualifications required of the entrants into the respective occupation classes. While the second method projects the education structure of the required flow of entrants, the first method projects the education structure of the stock of employed persons in 1970. The first method also uses *ex post* data on education, while in the second method employer expectations are estimated in a discretionary manner. The first method is described hereunder and the second method on page 28.

Projection of the Trend in the Observed Education Structure

The Data

Decennial Census data again were used in the projection of the observed education structures of the respective occupation groups. In this case data only for 1941, 1951 and 1961 are available.[1] The important shortcoming, however, is the fact that only elementary, formal high school and academic post-secondary education are taken into account. Vocational, technical and specialized schooling and training are ignored.

In addition, the comparability problem arose again in this instance. Whereas in 1941 and 1951 the data refer to the number of years of schooling, in 1961 they refer to the level of schooling attained. To make the concepts comparable, it was assumed that the schooling level that a person attained in 1961 was consistent with the number of years of school attendance. In fact, repetitions of certain school years would result in the number of school years being greater than the level of schooling attained. This suggests that there is a certain downward bias in the 1961 figures for years of schooling.

The education levels were aggregated into three groups: 0-8 years of schooling (elementary), 9-12 years (secondary), and 13 or more years (academic post-secondary).

The Projection

The use of Census data, or any type of *ex post* data, in projecting manpower requirements in terms of educational qualifications involves the implicit assumption that the structure of educational qualifications in each occupation group in the past has been primarily technogically determined. This also means that the heterogeneity of educational qualifications found in each occupation group is merely a reflection of the heterogeneity of functions within the major occupation group. Changes in the distribution of educational qualifications of an occupation group would then have to be interpreted as resulting from changes in the structure of functions within the occupation group. Table 8 gives the percentage education structure by occupation groups in terms of the three levels of years of schooling for 1941, 1951 and 1961. The projections to 1970 in the table were made by Dr. Herman Weisz of the Economics and Research Branch, Department of Labour, on a discretionary basis. The trends and projections are shown in Figure 4.

The projected education structures of the respective occupation groups were then applied to the B projections of the corresponding occupation groups to provide the projection of employment by occupation group and education level in absolute numbers. This is shown in Table 9. The B set of projections, which is based on the 1952-63-70 projection of the industry structure of employment, was selected because it is considered to be more reasonable than A, as was pointed out above in Chapter 2, page 13.

Summary of Findings

The projection indicates a significant rise in the educational requirements of job opportunities between 1961 and 1970. While the requirements for those with no more than elementary education is seen as increasing in absolute numbers, they are growing much less than the labour force as a whole

[1] The 1931 Census did not include a question on years of schooling of persons who were not attending school at the time. See *Manpower in Canada, 1931 to 1961 — Historical Statistics of the Canadian Labour Force* for a discussion of the education data.

and their proportion of employment is sharply declining. Those with high school education are projected at a growth rate about equal to that of the labour force, and employment opportunities that require higher education are increasing as a proportion of the labour force by about as much as those for people with only elementary education are declining.

It should be kept in mind that the projection of the group with 13 or more years of schooling involves a downward bias, probably for two reasons. First, a definite downward bias results from the fact that non-academic post-secondary education is excluded in 1961. Secondly, the slope of the trend will be underestimated due to the fact that in 1941 and 1951 the number of years of schooling was used rather than the level of schooling attained. The former approach ignores the repetition of grades.

TABLE 8

Percentage of the Labour Force in Each Occupation Group by Years of Schooling, 1941, 1951 and 1961 with a Projection to 1970

	Years of Schooling											
	0–8				9–12				13+			
Occupation Groups	1941	1951	1961	1970	1941	1951	1961	1970	1941	1951	1962	1970
All Occupations	58.7	50.7	40.8	33.3	34.0	39.1	42.8	43.4	7.3	10.2	16.3	23.3
Managerial	43.1	33.5	26.4	20.2	44.7	48.4	46.3	42.1	12.2	18.1	27.3	37.7
Professional	7.7	3.4	4.5	5.7	44.8	37.3	29.5	23.1	47.5	59.3	66.0	71.2
Clerical	17.6	15.7	12.9	10.7	66.8	69.2	66.1	61.9	15.6	15.1	21.0	27.4
Commercial	34.2	31.0	26.4	22.2	56.3	57.1	56.3	53.8	9.5	4.9	17.3	24.0
Manufacturing	58.3	58.1	52.8	47.0	38.0	38.2	41.1	43.0	3.7	3.7	6.1	10.0
Construction	66.5	62.0	56.3	50.7	30.6	34.7	38.3	41.0	2.9	3.3	5.4	8.3
Labourers	75.7	73.7	66.2	58.0	22.8	23.9	29.3	34.4	1.5	2.4	4.5	7.6
Transportation	63.7	58.4	51.6	42.6	33.4	38.3	42.5	47.2	2.9	3.3	5.9	10.2
Service	62.7	59.6	52.8	46.1	33.2	35.9	39.5	43.7	4.1	4.5	7.7	10.2
Agricultural	80.6	76.0	68.1	60.4	18.1	22.1	28.6	34.4	1.3	1.9	3.3	5.2
Fishing	87.9	84.2	78.0	70.3	11.5	15.0	20.1	25.4	.6	.8	1.9	4.3
Logging	88.1	84.1	77.3	69.2	11.2	14.3	19.6	25.4	.7	1.6	3.1	5.4
Mining	73.7	69.4	61.5	54.0	23.8	27.5	33.4	38.4	2.5	3.1	5.1	7.6

TABLE 9

Projections of the Number of Employed with Various Years of Schooling by Occupation Group for 1970

	Years of Schooling			
Occupation Groups	0-8 yrs.	9-12 yrs.	13 or more yrs.	Total
Managerial	141	295	264	700
Professional	56	226	696	977
Clerical	127	734	325	1,186
Commercial and Financial	148	358	160	666
Manufacturing and Mechanical	643	588	137	1,368
Construction Trades	200	162	33	395
Labourers	204	121	27	352
Transportation and Communications	260	288	62	611
Service	445	422	98	965
Agricultural	335	191	29	554
Fishing	15	6	1	22
Logging	37	14	3	54
Mining	17	12	2	32
All Occupations	2,628	3,417	1,837	7,883
		Historical		
1941	2,463	1,428	306	4,197
1951	2,644	2,037	533	5,214
1961	2,594	2,714	1,034	6,342

FIGURE 4

PERCENTAGE OF THE LABOUR FORCE IN EACH OCCUPATION GROUP BY YEARS OF SCHOOLING, 1941, 1951 AND 1961 WITH A PROJECTION TO 1970

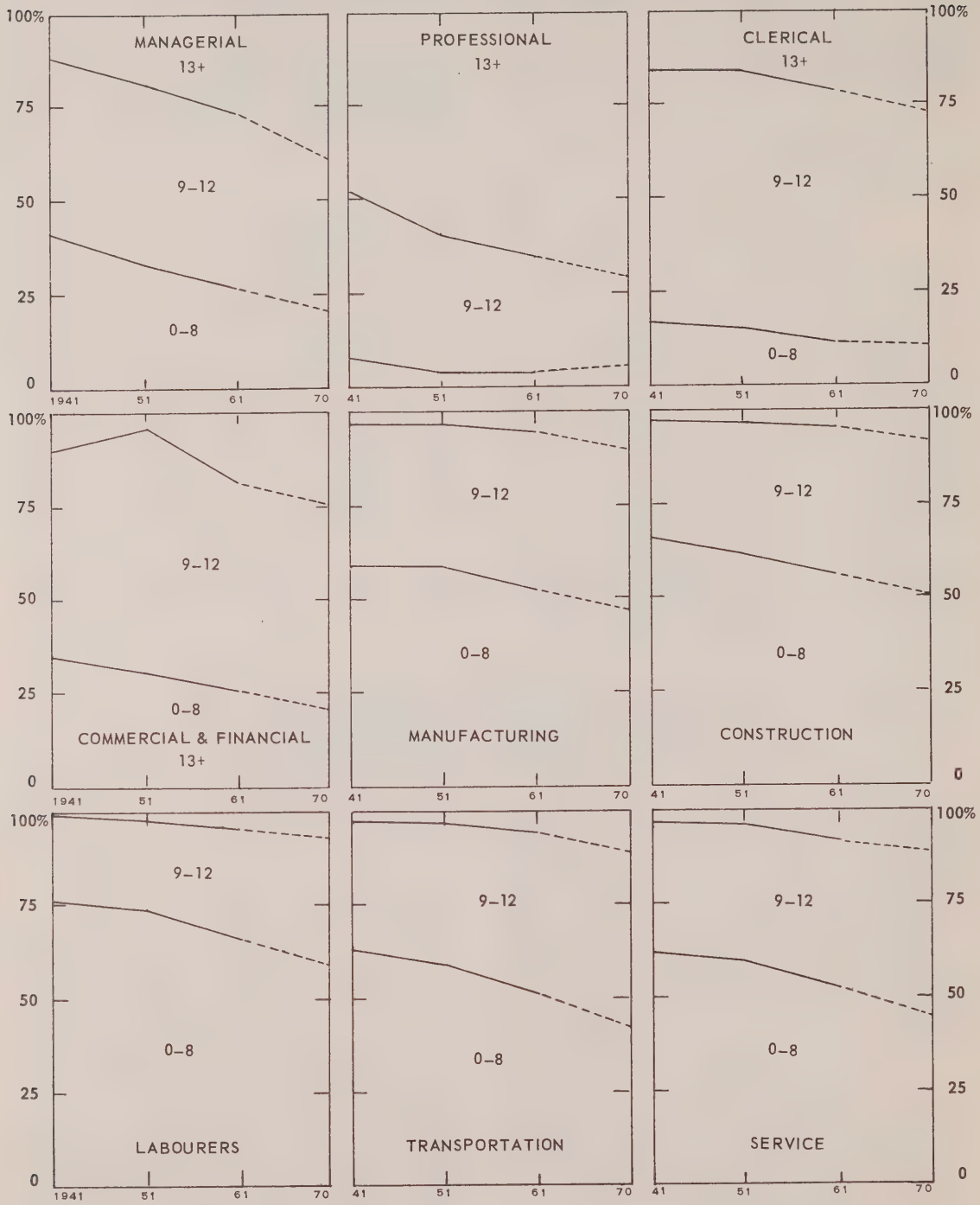
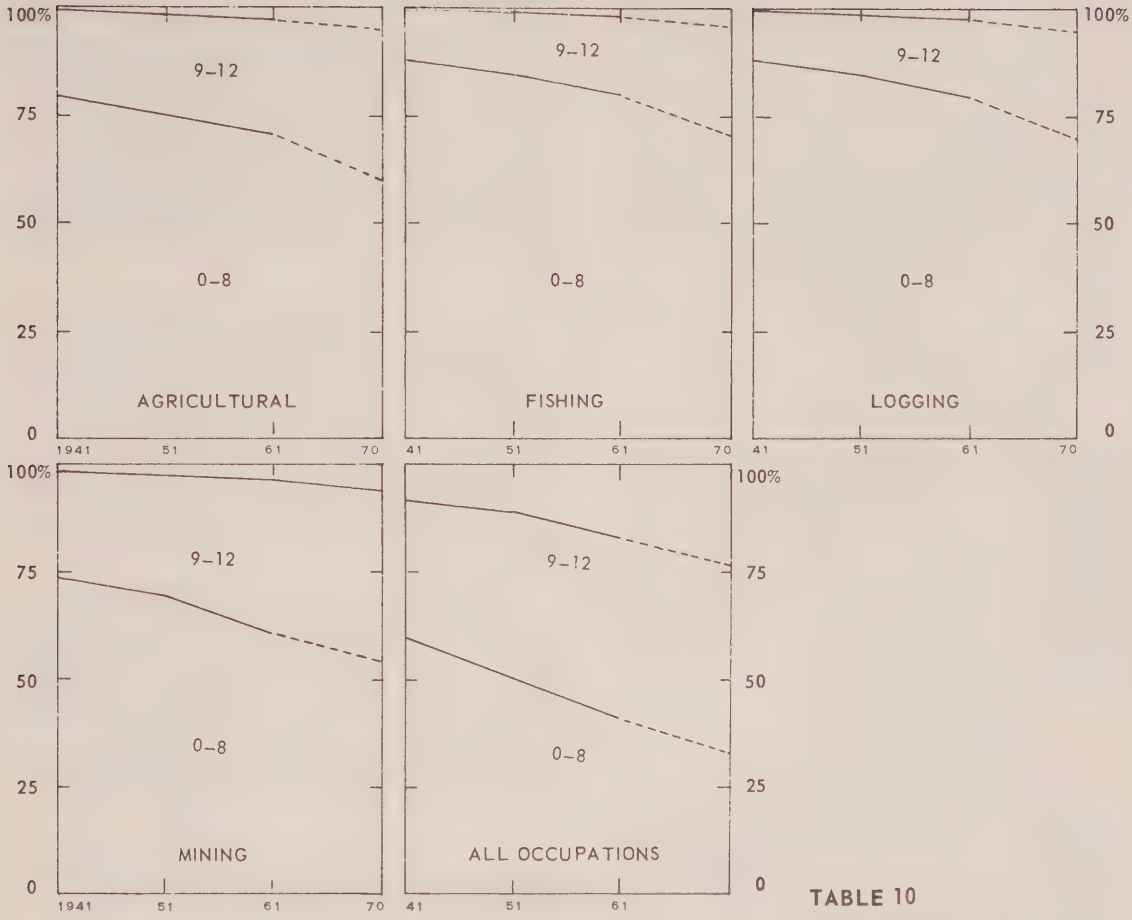


FIGURE 4 cont'd



Furthermore, it is important to note (see Table 10) that only about one third of the projected change in the education structure is attributable to a shift in the structure of occupation groups toward white-collar occupations, particularly professional and clerical occupations. The major part of the change is due to upward shifts in the occupation groups' education structures. This can be interpreted either as a shift of the functional requirements within the occupation groups towards those requiring higher educational qualifications, i.e. as an effect of shifts in the structure of labour requirements, or alternatively as an autonomous educational upgrading of the labour force, i.e. shifts in the structure of labour supply. Although the assumption underlying the above approach is that all sources of change in the education structure are the effects of the technologically shaped structure of labour demand, in the interpretation of the projection the problem of the interaction of demand and supply involved in *ex post* data and their extrapolation must not be ignored.

TABLE 10

Comparison of the Changes in the Overall Education Structure Induced by[1] Changes in the Overall Occupation Structure and[2] Changes in the Occupation Groups' Education Structures

	Years of Schooling			
	0–8	9–12	13+	Total[a]
1961	40.8	42.8	16.3	100.0
1970	33.3	43.4	23.3	100.0
1970 Occupation Structure with 1961 Education Structures	38.3	43.3	18.4	100.0
1961 Occupation Structure with 1970 Education Structures	36.0	43.0	21.1	100.0
Absolute Changes in Percentage Distribution Total[b]	−7.5	0.6	7.0	
Due to Changes in:				
— The Occupation Structure	−2.5	0.5	2.1	
— The Education Structures	−4.8	0.2	4.8	

(a) The horizontal additions may not amount to precisely 100 per cent in the first four rows and 0 per cent in the last three rows due to rounding errors.

(b) The two component of change may not add up to the total change because of rounding errors and the interaction of the two sources of change, i.e., $\Delta a \Delta b$ in $\Delta ab = a_p \Delta b + b_o \Delta a + \Delta a \Delta b$

Projection of the Required Educational Qualifications of Labour Force Entrants in 1961-70

The preceding projection has two major limitations. First, it requires the assumption that the observed education structure in the past is essentially determined by the concurrent technology, whereas it seems more reasonable to consider the educational standards that employers are setting as the result of the interaction of current labour demand and supply. Secondly, its break-down of the structure of educational qualifications is inadequate since it is too aggregative and also omits certain important kinds of education.

Consequently, the educational qualifications required for the respective occupations has to be estimated at the aggregation level of the occupation classes and specified in relatively great detail. Furthermore, since the educational qualifications required for experienced workers would be different from new entrants, they were considered to be relevant only to the labour force entrants between 1961 and 1970. Any educational upgrading required of those who entered the labour force before 1961 was therefore ignored in this projection.

The Specification of Required Educational Qualifications

The required educational qualifications were estimated primarily in terms of employer requirements, that is, in terms of what employers on the whole consider to be the minimum acceptable educational qualifications for a certain occupation. Actual or objective functional requirements were given only marginal consideration. These qualifications had to be estimated in a discretionary manner, since no such survey has been conducted. Their specification, which is given in Table 11, was done with the help of staff in the Manpower Training Branch of the Department of Manpower and Immigration.[2] (The distinction between comparable and non-comparable classes in the table will be explained at a later point in the discussion. See pages 42-49).

At this point the argument might be raised that the use of such very soft data makes the exercise of doubtful value. It is true that the results will not be very reliable statistically and that they must be considered in that light. However, that does not make the exercise entirely useless. If no data at all are available, decision-making has to be based on intuitive judgments. Soft data, on the other hand, is generally preferable to intuitive generalizations, since soft data can be put in the framework of a systematic model which makes it possible to ensure consistency among all the individual discretionary judgments made about very small facets of reality. It is a movement towards decision-making based upon good information.

For each occupation class, a unique set of educational qualifications was specified. In reality, of course, there are alternative educational avenues to each specific occupation, and many of the occupation classes include a variety of occupations with different educational requirements. Thus the specified educational requirements for each occupation class are to be regarded as nothing more than some kind of average of what employers require.

Owners and managers were excluded from this list because their breakdown into classes is based on industries rather than functions and this made it impossible to specify educational qualifications. Consequently, the method used in the previous section also had to be applied to the projection of the manpower requirements for managerial entrants in terms of educational qualifications (see page 49).

The breakdown of the educational system is much finer than in the preceding discussion. It is divided not only by grades, years of schooling, or degrees, but also by types of schooling. Thus, formal technical education as well as apprenticeship is included.

No differentiation, however, was made between various levels of elementary education. If it was thought that basic literacy was required, Grade VIII was stipulated. The division of high school education into the three branches is somewhat tenuous since usually academic high school education is fairly easily substitutable for technical or commercial secondary schooling as far as educational requirements for jobs are concerned.

"Trade school" means vocational schooling which does not require high school graduation. Post-secondary non-university schooling generally refers to technical institutes, but it also includes teachers' colleges, nursing schools, chiropractor colleges, art schools and pilot training. It includes Ontario's Colleges of Applied Arts and Technology.

[2] We owe special thanks in this respect to Messrs. R.B. Gwilliam, William Partin and E.H. Collins, who, however, are not responsible for the use of this data which they consider to be of very limited reliability.

TABLE II

Educational Requirements of Occupation Classes (excluding Owners and Managers) Applicable in the 1960's

Professional Occupations	Elementary Education (Grade)	High School (Grade)			Trade School (Years)	Post-Secondary Non-University Schooling[1] (Years)	University[2] (Degree)	Apprenticeship Training (Years)	Systematic[3] on-the-job Training (Years)
		Academic	Technical	Commercial					
Comparable Classes									
Professional engineers	VIII	XII	–	–	–	–	HP(Sc)	–	–
Veterinarians	VIII	XII	–	–	–	–	HP(Sc)	–	–
Professors and college principals	VIII	XII	–	–	–	–	PG	–	–
Secondary school teachers	VIII	XII	–	–	–	1[4]	G	–	–
Elementary school teachers	VIII	XII	–	–	–	2[4]	–	–	–
Physicians and surgeons	VIII	XII	–	–	–	–	HP(Sc)	–	–
Dentists	VIII	XII	–	–	–	–	HP(Sc)	–	–
Nurses, graduate	VIII	XII	–	–	–	3[5]	–	–	–
Nurses-in-training	VIII	XII	–	–	–	–	–	–	–
Osteopaths and chiropractors	VIII	XII	–	–	–	4[6]	–	–	–
Judges and magistrates	VIII	XII	–	–	–	–	HP(A)	–	–
Lawyers and notaries	VIII	XII	–	–	–	–	HP(A)	–	–
Clergymen and priests	VIII	XII	–	–	–	–	G	–	–
Artists, commercial	VIII	XII	–	–	–	2[7]	–	–	–
Artists (except commercial), art teachers	VIII	XII	–	–	–	2[7]	–	–	–
Authors, editors and journalists	VIII	XII	–	–	–	–	G	–	–
Musicians and music teachers	VIII	XII	–	–	–	–	–	–	–
Architects	VIII	XII	–	–	–	–	HP(Sc)	–	–
Actuaries and statisticians	VIII	XII	–	–	–	–	G	–	–
Librarians	VIII	XII	–	–	–	–	HP(A)	–	–
Photographers	VIII	–	XII	–	–	2	–	–	–
Non-Comparable Classes									
Physical scientists	VIII	XII	–	–	–	–	HP(Sc)	–	–
Biologists and agricultural professionals	VIII	XII	–	–	–	–	HP(Sc)	–	–
Teachers and instructors, n.e.s.	VIII	XII	–	–	–	2	–	–	–
Physical and occupational therapists	VIII	XII	–	–	–	–	HP(Sc)	–	–
Optometrists	VIII	XII	–	–	–	3	–	–	–
Pharmacists	VIII	XII	–	–	–	–	HP(Sc)	–	–
Medical technicians	VIII	XII	–	–	–	2	–	–	–
Health technicians	VIII	XII	–	–	–	2	–	–	–
Nuns and brothers	VIII	–	–	–	–	–	–	–	–
Mission workers	VIII	XII	–	–	–	–	–	–	–
Religious workers, n.e.s.	VIII	–	–	–	–	–	–	–	–
Draughtsmen and designers	VIII	–	XII	–	–	–	–	–	2
Surveyors	VIII	–	XII	–	–	–	–	–	S
Economists	VIII	XII	–	–	–	–	HP(A)	–	–
Computer programmers	VIII	XII	–	–	–	–	–	–	S
Accountants and auditors	VIII	–	–	XII	–	–	–	6[8]	–
Dietitians	VIII	–	XII	–	–	3	–	–	–
Social welfare workers	VIII	XII	–	–	–	–	–	–	–
Science and engineering technicians	VIII	–	XII	–	–	2	–	–	–
Managers in community services	VIII	XII	–	–	–	–	G	–	–

Footnotes 1 to 10 See p. 36

TABLE II (Cont'd)

	Elementary Education (Grade)	High School (Grade)			Trade School (Years)	Post-Secondary Non-University Schooling[1] (Years)	University[2] (Degree)	Apprenticeship Training (Years)	Systematic[3] on-the-job Training (Years)
		Academic	Technical	Commercial					
Managers in business services	VIII	XII	–	–	–	–	G	–	–
Managers in religious organizations, labour unions, trade associations	VIII	XII	–	–	–	–	–	–	–
Clerical Occupations									
Comparable Classes									
Attendants, doctors' and dentists' offices	VIII	–	–	XI	–	–	–	–	–
Office appliance operators	VIII	X	–	–	–	–	–	–	–
Shipping and receiving clerks, weighmen	VIII	–	–	X	–	–	–	–	–
Stenographers, typists, clerk-typists	VIII	–	–	XII	–	–	–	–	–
Non-Comparable Classes									
Bookkeepers and cashiers	VIII	–	–	XII	–	–	–	–	–
Stock clerks and storekeepers	VIII	–	–	XI	–	–	–	–	–
Proofreaders	VIII	XII	–	–	–	–	–	–	–
Office clerks and clerical occupations, n.e.s.	VIII	–	–	–	–	–	–	–	–
Commercial and Financial Occupations									
Comparable Classes									
Foremen, trade	VIII	–	–	XI	–	–	–	–	–
Auctioneers	VIII	X	–	–	–	–	–	–	–
Sales clerks and service station attendants	VIII	–	–	–	–	–	–	–	–
Advertising salesmen and agents	VIII	XII	–	–	–	–	G	–	–
Purchasing agents and buyers	VIII	–	–	XII	–	–	–	–	–
Brokers, agents, appraisers, n.e.s.	VIII	XII	–	–	–	–	–	–	–
Inspectors, graders, samplers, n.e.s.	VIII	–	XII	–	–	2	–	–	–
Interior decorators and window dressers	VIII	XII	–	–	–	3	–	–	–
Non-Comparable Classes									
Canvassers and other door-to-door salesmen	VIII	–	–	–	–	–	–	–	–
Hawkers and pedlars	–	–	–	–	–	–	–	–	–
Commercial travellers	VIII	–	–	–	–	–	–	–	–
News vendors	–	–	–	–	–	–	–	–	–
Insurance salesmen and agents	VIII	X	–	–	–	–	–	–	–
Real estate salesmen and agents	VIII	X	–	–	–	–	–	–	–
Security salesmen and brokers	VIII	XII	–	–	–	–	HP(A)	–	–
Credit men, moneylenders, pawnbrokers	VIII	X	–	–	–	–	–	–	–
Collectors, bills and accounts	VIII	–	–	–	–	–	–	–	–
Buyers of scrap and waste materials	VIII	–	–	–	–	–	–	–	–
Advertising time and space buyers	VIII	XII	–	–	–	–	–	–	S
Managers in business service	VIII	XII	–	–	–	–	G	–	–
Bottlers, packers, wrappers, labelers, stencilers, stampers	VIII	–	–	–	–	–	–	–	–
Manufacturing and Mechanical Occupations									
Comparable Classes									
Millers of plant and grain	VIII	–	–	–	–	–	–	4	–
Tobacco preparers and product makers	VIII	–	–	–	–	–	–	–	–
Tire and tube builders	VIII	–	–	–	–	–	–	4	–
Vulcanizers	VIII	–	–	–	–	–	–	4	–
Shoemakers and repairers, factory	VIII	–	–	–	–	–	–	–	1

Shoemakers and repairers, n.i.f. (not in factory)	VIII	–	–	–	1	–	–	–	–
Weavers	VIII	–	–	–	–	–	–	–	S
Dressmakers and seamstresses, n.i.f.	VIII	–	–	–	–	–	–	–	1
Upholsterers	VIII	–	–	–	–	–	–	–	S
Sawyers	VIII	–	–	–	–	–	–	–	S
Bookbinders and related occupations	VIII	–	X	–	–	–	–	–	S
Compositors and typesetters	VIII	–	XII	–	–	–	–	4	–
Inspectors, examiners, gaugers - metal	VIII	–	XII	–	–	2	–	–	–
Blacksmiths, hammermen, forgemen	VIII	–	–	–	–	–	–	4	–
Engravers, except photoengravers	VIII	–	X	–	–	–	–	4	–
Filers, grinders, sharpeners	VIII	–	IX	–	–	–	–	–	1
Fitters and assemblers, metal	VIII	–	IX	–	–	–	–	–	2
Heat treaters, annealers, temperers	VIII	–	IX	–	2	–	–	–	–
Mechanics and repairmen, automobile	VIII	–	X	–	–	–	–	4	–
Mechanics and repairmen, airplane	VIII	–	XI	–	–	–	–	4	–
Mechanics and repairmen, railroad equipment	VIII	–	X	–	–	–	–	4	–
Millwrights	VIII	–	X	–	–	–	–	4	–
Coremakers	VIII	–	X	–	–	–	–	–	2
Patternmakers	VIII	–	X	–	–	–	–	–	2
Polishers and buffers, metal	VIII	–	–	–	–	–	–	–	1
Riveters and rivet heaters	VIII	–	–	–	–	–	–	–	S
Rolling mill men	VIII	–	–	–	–	–	–	–	2
Sheet metal workers, tinsmiths	VIII	–	X	–	–	–	–	4	–
Toolmakers, diemakers, setters	VIII	–	XI	–	–	–	–	4	–
Welders and flame cutters	VIII	–	X	–	–	–	–	4	–
Stone cutters and dressers	VIII	–	XI	–	–	–	–	4	–
Photographic occupations, n.e.s.	VIII	–	XII	–	–	–	–	–	–
Motormen (vehicle) except railway	VIII	–	–	–	–	–	–	2	–
Power station operators	VIII	–	XI	–	2	–	–	–	S
Stationary engineers	VIII	–	XII	–	–	–	–	6	–
Non-Comparable Classes									
Bakers	VIII	–	–	–	–	–	–	–	4
Butchers and meat cutters	VIII	–	–	–	–	–	–	–	4
Food canners, curers, packers	–	–	–	–	–	–	–	–	–
Milk processors	VIII	–	–	–	–	–	–	–	4
Sugar refining operatives	–	–	–	–	–	–	–	–	–
Other food processing occupations	–	–	–	–	–	–	–	–	–
Beverage processors	VIII	–	–	–	–	–	–	–	–
Rubber shoe makers	VIII	–	X	–	–	–	–	–	–
Rubber workers, n.e.s.	VIII	–	–	–	–	–	–	–	–
Tanners	VIII	–	–	–	–	–	–	4	–
Tannery operatives	VIII	–	–	–	–	–	–	–	–
Curriers, leather dressers, finishers	–	–	–	–	–	–	–	–	–
Leather cutters	VIII	–	–	–	–	–	–	–	S
Trunk, bag, glove and belt makers	VIII	–	–	–	–	–	–	–	S
Harness and saddle makers	VIII	–	–	–	–	–	–	4	–
Machine operators, boot and shoe factory	VIII	–	–	–	–	–	–	–	–
Other leather occupations	VIII	–	–	–	–	–	–	–	–
Carders, combers and other fibre preparers	–	–	–	–	–	–	–	–	–
Spinners and twisters	–	–	–	–	–	–	–	–	–
Winders, warpers, reelers, beamers	VIII	–	–	–	–	–	–	–	S

Footnotes 1 to 10 See p. 36

TABLE II (Cont'd)

	Elementary Education (Grade)	High School (Grade)			Trade School (Years)	Post-Secondary Non-University Schooling[1] (Years)	University[2] (Degree)	Apprenticeship Training (Years)	Systematic[3] on-the-job Training (Years)
		Academic	Technical	Commercial					
Loom fixers and card grinders	VIII	–	XI	–	–	–	–	–	4
Knitters	VIII	–	–	–	–	–	–	–	S
Inspectors and menders textile	VIII	–	–	–	–	–	–	–	1
Bleachers and dyers, textile	VIII	–	XII	–	–	4	–	–	–
Textile printers	VIII	–	XI	–	–	–	–	–	4
Breakers, pickers and wool sorters	VIII	–	–	–	–	–	–	–	S
Finishers and calenderers	VIII	–	XI	–	–	–	–	–	4
Textile occupations, n.e.s.	VIII	–	–	–	–	–	–	–	–
Designers, clothing	VIII	XII	–	–	–	3	–	–	–
Tailors and tailoresses	VIII	–	–	–	–	–	–	–	1
Furriers	VIII	–	–	–	–	–	–	–	1
Milliners; hat and cap makers	VIII	–	–	–	–	–	–	–	1
Cutters, markers – textile; garment and glove leather	VIII	–	–	–	–	–	–	–	S
Sewers and sewing machine operators	VIII	–	–	–	–	–	–	–	S
Tent, sail, awning makers	VIII	–	–	–	–	–	–	–	S
Inspectors and examiner, textile goods	VIII	–	–	–	–	–	–	–	1
Sewers and sewing machine operators	VIII	–	–	–	–	–	–	–	S
Mattress makers and other upholstering occupations, n.e.s.	VIII	–	–	–	–	–	–	–	S
Button makers	VIII	–	–	–	–	–	–	–	S
Ironers and pressers, manufacturing	–	–	–	–	–	–	–	–	S
Apparel and related products makers, n.e.s.	VIII	–	–	–	–	–	–	–	–
Cabinet and furniture makers - wood	VIII	–	X	–	–	–	–	4	–
Box and packing case makers	VIII	–	–	–	–	–	–	–	–
Coopers	VIII	–	–	–	–	–	–	4	–
Carriage and wagon builders and repairers	VIII	–	–	–	–	–	–	4	–
Finishers and polishers - wood	VIII	–	–	–	–	–	–	4	–
Wood turners, planers, etc.	VIII	–	–	–	–	–	–	4	–
Woodworking machine operators	VIII	–	–	–	–	–	–	–	S
Inspectors, graders, scalers - logs and lumber	VIII	–	–	–	–	–	–	–	S
Brush and broom makers	–	–	–	–	–	–	–	–	–
Woodworking occupations, n.e.s.	VIII	–	–	–	–	–	–	–	–
Batch and continuous still operators	VIII	–	–	–	–	–	–	–	1
Roasters, cookers and other heat treaters, chemical	VIII	–	–	–	–	–	–	4	–
Cellulose pulp preparers, n.e.s.	VIII	–	–	–	–	–	–	–	S
Paper makers	VIII	–	XI	–	–	–	–	–	4
Paper making occupations, n.e.s.	VIII	–	–	–	–	–	–	–	–
Crushers, millers, calenderers, n.e.s. - chemical	VIII	–	X	–	–	–	–	–	1
Paint and varnish makers	VIII	–	XII	–	–	3	–	–	–
Petroleum refiners	VIII	–	XI	–	–	–	–	–	4
Chemical and related process workers, n.e.s.	VIII	–	–	–	–	–	–	–	–
Paper product makers	VIII	–	–	–	–	–	–	–	–
Pressmen and plate printers	VIII	–	–	–	–	–	–	4	–
Printing workers, n.e.s.	VIII	–	–	–	–	–	–	4	–
Photographic processing occupations	VIII	–	XI	–	–	–	–	–	–
Furnacemen and heaters, metal	VIII	–	–	–	–	–	–	4	–
Potmen	VIII	–	–	–	–	–	–	4	–

Moulders	VIII	–	–	–	–	–	–	4	–
Coppersmiths	VIII	–	–	–	–	–	–	4	–
Metal drawers and extruders	VIII	–	–	–	–	–	–	4	–
Wire drawers, makers and weavers	VIII	–	–	–	–	–	–	4	–
Metal treating occupations, n.e.s.	VIII	–	–	–	–	–	–	4	–
Jewellers and watchmakers	VIII	–	X	–	2	–	–	–	–
Musical instrument makers	VIII	–	–	–	–	–	–	4	–
Machinists and machine tool setters	VIII	–	X	–	–	–	–	4	–
Metalworking machine operators, n.e.s.	VIII	–	–	–	–	–	–	2	–
Boilermakers, platers and structural metal workers	VIII	–	–	–	–	–	–	4	–
Electroplater, dip platers and related workers	VIII	–	–	–	–	–	–	4	–
Metalworking occupations, n.e.s.	VIII	–	–	–	–	–	–	4	–
Dental mechanics	VIII	–	XII	–	–	2	–	–	–
Mechanics and repairmen, office machines	VIII	–	X	–	–	–	–	4	–
Mechanics and repairmen, n.e.s.	VIII	–	X	–	–	–	–	4	–
Scientific instrument and professional equipment makers and repairers	VIII	–	XII	–	–	3	–	–	–
Armature winders and coil insulators	VIII	–	IX	–	–	–	–	–	S
Battery makers and repairers	VIII	–	IX	–	–	–	–	–	S
Electric lamp makers	VIII	–	–	–	–	–	–	–	S
Fitters and assemblers, electrical	VIII	–	X	–	–	–	–	–	2
Electrical repairmen	VIII	–	XI	–	–	–	–	4	–
Mechanics and repairmen, radio and T.V.	VIII	–	XI	–	–	–	–	4	–
Electrical and electronics workers, n.e.s.	VIII	–	IX	–	–	–	–	–	1
Lime, plaster and cement makers	VIII	–	–	–	–	–	–	4	–
Brick and tile makers	VIII	–	–	–	–	–	–	4	–
Furnacemen and kiln burners, ceramics and glass	VIII	–	–	–	–	–	–	4	–
Glass blowers	VIII	–	–	–	–	–	–	4	–
Opticians; lens grinders and polishers	VIII	–	–	–	–	–	–	4	–
Clay, glass and stone workers, n.e.s.	VIII	–	–	–	–	–	–	–	S
Boiler firemen (except ship)	VIII	–	–	–	–	–	–	4	–
Hoistmen, cranemen, derrickmen	VIII	–	–	–	–	–	–	–	S
Riggers and cable splicers	VIII	–	–	–	–	–	–	–	S
Construction machinery operators	VIII	–	–	–	1	–	–	–	S
Oilers and greasers	VIII	–	–	–	–	–	–	–	S
Foremen	VIII	–	X	–	–	–	–	–	4
Construction Occupations									
Comparable Classes									
Foremen	VIII	–	XII	–	–	–	–	4	S
Inspectors	VIII	–	XII	–	–	–	–	4	S
Masons; cement and concrete finishers	VIII	–	–	–	–	–	–	4	–
Carpenters	VIII	–	IX	–	–	–	–	4	–
Painters, decorators, glaziers	VIII	–	–	–	–	–	–	4	–
Plasterers and lathers	VIII	–	IX	–	–	–	–	4	–
Plumbers and pipe fitters	VIII	–	X	–	–	–	–	4	–
Non-Comparable Classes									
Structural metal workers	VIII	–	–	–	–	–	–	–	2
Insulation appliers	VIII	–	–	–	–	–	–	4	–
Electricians and wiremen	VIII	–	XI	–	–	–	–	4	–
Roofers and slaters	VIII	–	–	–	–	–	–	–	S
Japanners, enamellers, lacquerers	VIII	–	–	–	–	–	–	4	–
Construction workers, n.e.s.	VIII	–	–	–	–	–	–	–	S
Canoe and boat builders	VIII	–	–	–	–	–	–	4	–

Footnotes 1 to 10 See p. 36

TABLE II (Cont'd)

	Elementary Education (Grade)	High School (Grade)			Trade School (Years)	Post-Secondary Non-University Schooling[1] (Years)	University[2] (Degree)	Apprenticeship Training (Years)	Systematic[3] on-the-job Training (Years)
		Academic	Technical	Commercial					
Labourers									
Transportation and Communication									
Comparable Classes									
Air pilots and navigators	VIII	XII	–	–	–	2(9)	–	–	–
Locomotive engineers	VIII	–	–	–	–	–	–	4	–
Locomotive firemen	VIII	–	–	–	–	–	–	4	–
Conductors, railroad	VIII	–	–	–	–	–	–	–	–
Agents - ticket, station, express	VIII	–	–	X	–	–	–	–	–
Baggagemen and expressmen	–	–	–	–	–	–	–	–	–
Brakemen, switchmen, signalmen	VIII	–	–	–	–	–	–	–	–
Sectionmen and trackmen	VIII	–	–	–	–	–	–	–	–
Deck and engineering officers, ship	VIII	–	XII	–	–	4[10]	–	–	–
Longshoremen, stevedores, dock labourers	–	–	–	–	–	–	–	–	–
Bus drivers	VIII	–	IX	–	–	–	–	–	–
Taxi drivers and chauffeurs	VIII	–	–	–	–	–	–	–	–
Operator, electric street railway	VIII	–	–	–	–	–	–	–	–
Radio and T.V. announcers and broadcasters	VIII	XII	–	–	–	–	–	–	–
Telephone operators	VIII	XI	–	–	–	–	–	–	–
Telegraph operators	VIII	XI	–	–	–	2	–	–	–
Linemen and servicemen - utilities	VIII	–	–	–	–	–	–	4	–
Postmen and mail carriers	VIII	–	–	–	–	–	–	–	–
Non-Comparable Classes									
Inspectors and foremen - transport	VIII	–	X	–	–	–	–	4	–
Seamen, sailors, deckhand	–	–	–	–	–	–	–	–	–
Engine room crew, firemen, oilers - ship	VIII	–	–	–	–	–	–	4	–
Lock keepers, canalmen, boatmen	VIII	–	–	–	–	–	–	–	–
Dispatchers, train	VIII	–	–	–	–	–	–	–	–
Driver-salesmen	VIII	–	–	–	–	–	–	–	–
Truck drivers	VIII	–	–	–	–	–	–	–	1
Teamsters	–	–	–	–	–	–	–	–	–
Deliverymen and drivers, n.e.s.	VIII	–	–	–	–	–	–	–	–
Materials-handling equipment operators	VIII	–	–	–	–	–	–	–	S
Gate tenders - railway	–	–	–	–	–	–	–	–	–
Motormen - railway	VIII	–	–	–	–	–	–	2	–
Other transport occupations	VIII	–	–	–	–	–	–	–	–
Warehouse foremen, n.e.s.	VIII	–	–	XI	–	–	–	–	–
Inspectors and foremen - communication	VIII	XII	–	–	–	2	–	–	–
Radio and T.V. equipment operators	VIII	–	XII	–	–	2	–	–	–
Messengers	–	–	–	–	–	–	–	–	–
Other communication occupations	VIII	–	–	–	–	–	–	–	–
Service Occupations									
Comparable Classes									
Firemen - fire department	VIII	–	–	–	–	–	–	–	1
Policemen and detectives	VIII	X	–	–	–	–	–	–	1

Guards, watchmen, caretakers, n.e.s.	–	–	–	–	–	–	–	–	–
Cooks	VIII	–	–	–	–	–	–	2	–
Waiters and waitresses	VIII	–	–	–	–	–	–	–	–
Nurses, practical	VIII	–	–	–	–	–	–	–	–
Porters, hairdressers, manicurists	–	–	–	–	–	–	–	–	–
Barbers, hairdressers, manicurists	VIII	X	–	–	1	–	–	–	–
Cleaners, dyers, launderers	VIII	–	–	–	–	–	–	–	–
Elevator tenders	–	–	–	–	–	–	–	–	–
Charworkers, cleaners, janitors, sextons	–	–	–	–	–	–	–	–	–
Undertakers	VIII	–	–	–	–	–	–	4	–
Guides	VIII	XII	–	–	–	–	–	–	–
Motion picture projectionists	VIII	–	XII	–	–	–	–	–	–
Non-Comparable Classes									
Lodging and boarding house keepers	VIII	–	–	–	–	–	–	–	–
Housekeepers (except private household), matrons, stewards	VIII	–	–	–	–	–	–	–	–
Hotel, cafe and private household workers	–	–	–	–	–	–	–	–	–
Bell-boys and porters - not railway	–	–	–	–	–	–	–	–	–
Maids and domestic servants, n.e.s.	–	–	–	–	–	–	–	–	–
Bootblacks	–	–	–	–	–	–	–	–	–
Babysitters	–	–	–	–	–	–	–	–	–
Bartenders	VIII	–	–	–	1	–	–	–	–
Athletes, entertainers and related workers	VIII	XII	–	–	–	–	–	–	–
Attendants - recreation and amusement	–	–	–	–	–	–	–	–	–
Foremen and inspectors in water works and sewage disposal	VIII	–	X	–	–	–	–	–	4
Foremen and inspectors in local administration	VIII	XII	–	–	–	–	–	–	2
Public service occupations, n.e.s.	VIII	–	–	–	–	–	–	–	–
Agricultural Occupations Comparable Classes									
Farm managers	VIII	–	XII	–	–	–	–	–	–
Non-Comparable Classes									
Farmers and stock-raisers	VIII	–	XII	–	–	–	–	–	–
Gardeners (except farm) and ground keepers	VIII	–	XII	–	–	–	–	–	–
Apiarists	VIII	–	XII	–	–	–	–	–	–
Farm Labourers	–	–	–	–	–	–	–	–	–
Other agricultural occupations	VIII	–	–	–	–	–	–	–	–
Fishing, Trapping, Hunting	–	–	–	–	–	–	–	–	–
Logging									
Comparable Class									
Forest rangers and timber cruisers	VIII	–	–	–	1	–	–	–	–
Non-Comparable Classes									
Logging foremen	VIII	–	–	–	–	–	–	–	–
Lumbermen, incl. labourers in logging	–	–	–	–	–	–	–	–	–
Riggers in logging	VIII	–	–	–	–	–	–	–	–
Mining and Quarrying									
Comparable Class									
Prospectors	VIII	–	XII	–	–	3	–	–	–
Non-Comparable Classes									
Foremen	VIII	–	XII	–	–	2	–	–	S
Timbermen	VIII		XII	–	–	–	–	–	–

Footnotes 1 to 10 See p. 36

TABLE II (Cont'd)

	Elementary Education (Grade)	High School (Grade)			Trade School (Years)	Post-Secondary Non-University Schooling[1] (Years)	University[2] (Degree)	Apprenticeship Training (Years)	Systematic[3] on-the-job Training (Years)
		Academic	Technical	Commercial					
Miners, n.e.s.	VIII	–	–	–	–	–	–	–	S
Haulage workers – drivers, cagers	–	–	–	–	–	–	–	–	–
Millmen	VIII	–	X	–	–	–	–	–	–
Labourers, mine	–	–	–	–	–	–	–	–	–
Quarriers and related workers, n.e.s.	–	–	–	–	–	–	–	–	–
Well drillers and related workers, n.e.s.	VIII	–	X	–	–	–	–	–	–

(1) Generally refers to technical institute, except where otherwise indicated by a footnote.
(2) Codes for the various types of degrees: G = general; HP(A) = honours or professional degree in the humanities and social sciences; HP(Sc) = honours or professional degree in the natural and applied sciences; PG = post-graduate degree.
(3) S stands for "some training", i.e., less than one year.
(4) Teachers' college.
(5) Nursing school.
(6) Chiropractor college.
(7) Art school.
(8) The six years refer to the 5-year articleship of chartered and Industrial Accountants, together with the grade XIII requirement which is applicable in Ontario. It was discovered only after the completion of the tabulations that most provinces have moved toward requiring a university degree plus a 3-year articleship.
(9) Air pilot training.
(10) Marine school.

Apprenticeship training refers to any program of technical instruction together with on-the-job experience for tradesmen or craftsmen. A five-year articleship period for accountants has been included in this category.[3] There is a general bias in the specification of trade school, post-secondary non-university education and apprenticeship requirements in that if we were aware of a program specifically geared to a certain occupation, it was specified as a requirement even though only a minority of employers might actually consider such a program a prerequisite for employment.

University degrees were divided into three levels, (1) general, (2) honours or professional, and (3) postgraduate, and two branches, Arts, i.e., humanities and social sciences, and Science, i.e., the natural and applied sciences. However, the occupation classes whose university education was estimated to be a general undergraduate program, or, in the case of professors, postgraduate studies were too heterogeneous to permit the arts-science dichotomy.

The specification of required systematic on-the-job training involved largely guess work. To a certain extent this category served as a spillover for on-the-job training which could not properly be entitled apprenticeship training. The other terminological boundary line, that of systematic on-the-job training with informal on-the-job training, is particularly blurred and makes the specifications for this category of very limited value.

It should be noted that the assisting staff of the Manpower Training Branch were skeptical about this exercise because of the diversity and variability in the required job qualifications and a serious lack of information about them. This applies especially to systematic on-the-job training. However, while this point emphasizes the fact that neither the specification of educational requirements nor the projected required educational structure derived from it can be used with any degree of precision—as well as the fact that research in this area is badly needed—this approach does give us a rough idea of the future requirements.

The Disaggregation of the Occupation-Group Projections

Since the educational qualifications have been specified in terms of the more detailed occupation classes rather than highly aggregative occupation groups, for which the projections in the previous chapter were made, the occupation-group projections of Chapter 3 had to be broken down into projections of occupation classes. The breakdown was based on freehand extrapolations of either 1) the logarithmic trend in the size of the occupation class from 1931 to 1961, or 2) the trend in the occupation class as a proportion of the occupation group to which it belongs, or 3) the trend in the occupation class as a proportion of the total labour force. The most consistent trend or the trend representing the most reasonable relationship determined the choice between the three alternative techniques. (See Table 12.) The only exceptions to this system of projections were some of the health professions, which were projected on the basis of the projection for doctors and physicians made by S. Judek,[4] and the teachers, whose projection is related to a projection of the school-age population.

Ideally, the occupation-group structure of each industry division, rather than merely the aggregate structure, should have been disaggregated into the appropriate occupation-class structure. However, this would have been extremely time- and resource-consuming work, and it was not likely that such a refinement would significantly improve the meaningfulness of the projections. Consequently, the relationship of individual occupation classes to particular industries was not taken into account.

Just as in the case of the occupation-group structures of the industry divisions, it is assumed that the percentage occupation-class structure of the labour force in each occupation group has in the past adequately represented the corresponding structure of employment if the latter were adjusted to full-employment conditions. Such a crudeness is justified on the basis of the fact that what is being projected are not individual occupation classes but only *a weighting system* to be applied to the structure of educational qualifications. The distinction is important because inaccuracies and errors in these projections are not particularly serious when the projections are used as weights to determine the educational structure of an occupation group since the errors are likely to offset each other to a large extent (e.g., an overestimate for civil engineers may be offset by an underestimate for architects since both occupations have the same general educational requirements).

[3] See footnote 8 in Table 11.

[4] Stanislaw Judek, *Medical Manpower in Canada*, a study prepared for the Royal Commission on Health Services (Queen's Printer, Ottawa, 1964). The parallel study by Bruce A. McFarlane, *Dental Manpower in Canada*, contains a variety of estimates of the number of dentists needed in Canada, based on projected populations and various population — dentist ratios (see p. 27). Our estimate of 8,000 in 1971 based on a projection of percent of the occupation group, is above his Figure of 7,270 based on the 1962 population — dentist ratio for Canada, but below the figure of 9,390 based on the 1961 population — dentist ratio in British Columbia — the most favourable provincial ratio in Canada.

TABLE 12

Occupational Projections
('000)

	Labour Force				Employment	
	1931 (a)	1941 (a)	1951	1961	Projected to 1971(b)	Adjusted to 1970(c)
All Occupations	3,917.6	4,196.0	5,214.9	6,342.3	7,965.9	7,833.0
Proprietary and Managerial	319.8	225.6	392.9	500.9	716.2	700.0
Professional:	238.1	282.2	385.7	634.3	1,006.1	977.0
Architects	1.3	1.2	1.7	2.9	5.0(d)	4.8
Artists (ex. comm.), art teachers	(.3)	(.5)	1.1	2.3	4.6(d)	4.4
Artists, commercial	(2.0)	(2.8)	3.8	5.2	7.0(d)	6.9
Authors, editors, journalists	3.3	4.1	7.2	13.0	24.0(d)	23.1
Clergymen and priests	12.7	14.1	16.1	18.8	18.5(d)	18.5
Dentists	4.0	3.7	4.6	5.5	8.0(f)	7.8
Engineers:						
Chemical	(2.3)	(2.5)	2.6	3.0	3.3(d)	3.2
Civil	(3.2)	(5.2)	7.7	11.9	16.5(d)	16.1
Electrical	3.9	4.6	6.3	8.8	12.5(d)	12.2
Mechanical	2.9	4.5	8.3	12.1	17.0(d)	16.6
Judges and magistrates	.5	.5	.6	.8	1.2(f)	1.2
Lawyers and notaries	8.1	7.9	9.0	12.1	16.1(f)	15.8
Librarians	1.0	1.6	2.1	3.4	5.6(d)	5.4
Musicians and music	8.8	7.9	8.0	11.3	15.1(f)	14.8
Nurses, graduate	20.5	26.6	35.1	61.6	115.7(h)	111.5
Nurses-in-training	11.4	11.9	15.6	23.0	35.4(h)	34.4
Osteopaths and chiropractors	.5	.6	.8	1.1	1.5(e)	1.5
Physicians and surgeons	10.0	10.7	14.3	21.3	33.1(g)	32.1
Professors and college principals	3.2	4.1	5.4	11.1	24.0(d)	23.0
Actuaries and statisticians	(.1)	(.3)	1.0	2.9	8.3(d)	7.9
Photographers	2.6	2.7	3.6	3.7	4.0(d)	4.0
Teachers, school	83.0	86.5	103.6	167.7	203.4(j)	200.6
Elementary	....	...	...	121.5(k)	...	121.2(1)
Secondary	...	...	...	46.2(k)	...	79.4(1)
Veterinarians	1.0	1.1	1.2	1.5	1.0(f)	1.1
Others	(51.1)	(76.7)	125.7	229.4	425.4	410.0
Clerical	260.7	303.7	563.1	818.9	1,216.4	1,186.0
Attendants, doctors and dentists offices	(1.3)	(1.9)	2.7	3.9	6.1(i)	6.0
Office appliance operators	1.7	3.0	11.0	28.4	73.0(f)	69.6
Shipping and receiving clerks	(35.5)	(41.0)	48.9	56.2	64.0(d)	63.4
Stenographers, typists, clerk-typists	68.5	81.2	138.5	216.4	330.0(d)	321.3
Others	(153.6)	(176.6)	361.9	514.0	743.3	725.8
Commercial and Financial	239.7	247.2	349.0	492.6	673.4	666.0
Foremen	(3.9)	(4.5)	6.8	10.5	15.5(f)	15.3
Advertising agents	(.6)	(1.0)	1.8	3.2	5.5(d)	5.4
Auctioneers	(.3)	.3	.3	.4	.4(d)	.4
Brokers, agents, appraisers, n.e.s.	(1.3)	(2.2)	3.6	5.9	9.5(d)	9.4
Inspectors, graders, samplers, n.e.s.	(2.7)	(3.2)	3.7	4.4	5.2(d)	5.2
Purchasing agents and buyers	6.6	9.5	14.0	14.7	15.5(d)	15.5
Window decorators and dressers	.9	1.0	2.4	4.0	6.1(f)	6.0
Sales clerks and service station attendants	319.8	137.9	180.9	249.6	336.7(f)	333.1
Others	(178.0)	(87.8)	135.4	200.0	279.0	275.8
Manufacturing and Mechanical	452.3	673.0	907.6	1,036.9	1,393.8	1,368.0
Millers — flour, grain	1.6	2.6	2.1	2.2	2.5(f)	2.5
Tobacco preparers and products makers	(3.0)	(3.3)	3.7	4.1	4.5(d)	4.4
Tire tube builders	(9.5)	(6.3)	4.1	2.7	1.8(d)	1.9
Vulcanizers	.9	1.1	1.7	2.4	3.5(e)	3.4
Shoemakers and repairers (factory)	(6.3)	(8.0)	10.2	12.8	16.1(d)	15.9
Shoemakers and repairers, n.i.f.	7.5	8.0	6.3	4.9	3.8(d)	3.8
Weavers — textiles	7.1	9.5	9.0	4.5	2.3(d)	2.4
Dressmakers and seamstresses, n.i.f.	(7.4)	10.9	14.5	16.2	21.3(f)	21.0
Sawyers — wood	4.1	8.2	13.3	13.3	11.0(d)	11.2
Upholsterers	3.4	3.6	5.1	5.7	7.3(e)	7.2
Bookbinders	(1.4)	(2.2)	3.2	4.0	5.8(f)	5.7
Other occupations in bookbinding, n.e.s.	(.7)	(1.1)	1.6	1.9	2.6(f)	2.6
Compositors and typesetters	(13.5)	(14.3)	15.3	16.3	17.5(d)	17.4
Inspectors, examiners, gaugers	4.4	12.4	12.9	14.6	18.8(f)	18.5
Blacksmiths, hammermen, forgemen	16.4	15.1	9.6	5.1	2.0(d)	2.2
Engravers, except photoengravers	(.9)	(.9)	.9	1.0	1.0(d)	1.0
Filers, grinders, sharpeners	2.2	4.8	6.9	5.9	5.3(f)	5.3
Fitters and assemblers, metals, n.e.s.	3.9	11.8	16.6	17.6	18.0(d)	18.0
Heat treaters, annealing temperers	(.4)	(.6)	.8	1.0	1.4(d)	1.4
Mechanics and repairmen, auto	(34.5)	(47.0)	64.3	89.0	120.0(d)	117.8
Mechanics, repairmen, airplane	(0)	(1.3)	3.9	6.8	12.3(f)	11.9
Mechanics and repairmen, railroad carshop	(16.2)	(12.3)	9.3	7.1	5.4(d)	5.5
Millwrights	3.4	4.7	8.1	9.8	13.5(d)	13.2
Coremakers	(2.3)	(2.4)	2.1	1.0	.6(f)	.6
Patternmakers	1.3	1.7	2.3	2.0	2.4(f)	2.3

TABLE 12 (Cont'd)

	Labour Force				Employment	
	1931(a)	1941(a)	1951	1961	Projected to 1971(b)	Adjusted to 1970(c)
Polishers and buffers, metal	2.0	3.3	3.8	2.8	2.2(f)	2.3
Riveters and rivet heaters	(2.0)	(2.3)	2.2	1.4	.5(f)	.6
Rolling mill men, n.e.s.	.5	.9	1.7	2.3	3.5(f)	3.4
Sheet metal workers, tinsmiths	7.6	10.6	13.8	17.1	22.0(d)	21.6
Toolmakers, diemakers, setters	2.9	7.0	9.4	10.6	13.9(e)	13.7
Welders and flame cutters	2.5	12.1	23.6	38.7	65.5(f)	63.6
Stone cutters and dressers	2.9	1.9	1.9	1.7	1.8(f)	1.8
Photographic occup., n.e.s.	(.5)	(.9)	1.7	3.1	5.6(d)	5.4
Boiler firemen	6.8	8.2	11.0	6.7	4.2(f)	4.4
Motormen (vehicle) except railway	(1.0)	(1.5)	2.1	2.4	3.2(f)	3.1
Power station operators	(1.1)	2.3	3.9	4.9	7.1(f)	7.0
Stationary engineers	(12.6)	(18.8)	25.6	29.3	39.4(f)	38.7
Others	(257.6)	(408.9)	579.2	664.2	924.3	905.5
Construction	183.6	196.1	291.4	335.9	399.3	395.0
Foremen	(1.8)	4.0	11.6	18.2	28.0(f)	27.3
Inspectors	(.1)	.4	1.6	3.9	11.0(d)	10.5
Brick and stone masons, cement and concrete concrete finishers	12.1	8.9	18.8	27.0	37.3(f)	36.6
Carpenters	81.8	90.5	129.0	121.8	113.8(f)	114.4
Painters, decorators, glaziers	35.3	39.3	47.2	51.2	58.0(f)	57.5
Plasterers and lathers	6.2	4.7	9.3	10.0	11.6(f)	11.5
Plumbers and pipe fitters	17.5	19.5	29.5	37.5	48.7(f)	48.0
Others	(28.7)	28.7	44.4	66.2	90.9	89.2
Labourers	441.7	265.7	351.2	343.8	352.5	352.0
Transportation and Communications	245.8	266.7	413.3	496.8	619.8	611.0
Agents – ticket, station, express	5.3	5.0	6.6	8.5	11.3(e)	11.1
Air pilots and navigators (civilian)	.3	.6	1.1	2.7	6.5(d)	6.2
Baggagemen and expressmen	1.9	1.5	2.3	1.8	1.7(f)	1.7
Brake, signal, switch and flagmen rlwy.	12.9	11.9	11.9	11.2	5.0(f)	5.4
Bus drivers	(.8)	3.0	11.5	18.6	26.7(f)	26.1
Captains, mates, pilots and eng. officers	7.0	5.9	7.8	8.1	9.3(f)	9.2
Chauffeurs and taxi drivers	(14.6)	12.3	21.4	22.1	23.2(f)	23.2
Conductors – steam railway	4.7	4.2	6.4	5.7	5.3(f)	5.3
Locomotive engineers	7.9	7.1	9.4	7.6	6.2(f)	6.3
Locomotive firemen	5.9	5.2	7.3	3.7	1.9(f)	2.0
Longshoremen, stevedores dock labourers	7.4	10.9	10.6	12.3	15.4(e)	15.2
Operators electric street railways	8.7	6.5	6.2	1.3	0(f)	.1
Sectionmen and trackmen	23.6	24.4	30.4	23.2	12.4(f)	13.2
Linemen and servicemen	(6.6)	(9.9)	19.5	28.4	41.5(f)	40.6
Postmen and mail carriers	6.8	7.4	9.0	13.4	19.0(d)	18.6
Radio announcers, broadcasters	(.2)	.4	1.0	1.6	2.7(f)	2.6
Telegraph operators	6.8	5.4	6.6	4.4	2.5(f)	2.6
Telephone operators	15.7	13.8	30.7	35.4	40.0(d)	39.7
Others	(108.7)	(131.3)	210.3	286.8	389.4	382.0
Services	359.6	439.7	446.0	683.9	987.8	965.0
Personal	324.0	391.2	382.2	588.4		
Barbers, hairdressers, manicurists	23.1	25.9	24.4	42.1	55.0(d)	54.0
Charworkers, cleaners, janitors, sextons	20.7	27.0	51.4	101.0	173.8(f)	168.4
Cleaners, dyers, launderers	18.0	17.9	26.9	31.6	38.0(d)	37.5
Elevator tenders	3.4	3.9	5.3	5.3	5.3(e)	5.3
Guides	(1.2)	(1.6)	2.1	3.0	4.0(d)	3.9
Nurses, practical	6.7	11.2	25.5	62.4	135.5	130.1
Porters	5.4	5.1	5.8	5.2	5.0(d)	5.0
Undertakers	1.6	2.1	2.3	2.7	3.1(d)	3.1
Waiters and waitresses	24.0	36.7	61.1	88.0	127.5(e)	124.5
Cooks	25.7	27.8	35.2	49.6	70.0(d)	68.5
Protective and Others	35.6	48.5	63.9	95.5		
Firemen – fire department	4.6	5.0	8.9	14.3	22.5(d)	21.9
Guards, watchmen, caretakers	13.5	20.9	25.7	34.9	47.0(d)	46.1
Policemen and detectives	11.0	16.1	20.1	30.0	42.5(d)	41.6
Motion picture projectionist	1.4	1.5	1.9	1.4	1.0(d)	1.0
Others	(199.4)	(237.1)	149.5	212.6	257.6	254.2
Primary	1,274.8	1,284.6	1,050.1	830.2		
Agricultural	1,127.7	1,083.8	830.4	648.9	542.2	554.0
Farm managers	3.1	3.1	3.9	3.3	4.4(f)	4.3
Others	1,124.6	1,080.7	826.5	645.6	537.8	549.7

TABLE 12 (Cont'd).

	Labour Force				Employment	
	1931(a)	1941(a)	1951	1961	Projected to 1971(b)	Adjusted to 1970(c)
Fishing, Trapping, Hunting	47.7	51.5	53.0	37.0	20.5	22.0
Logging	42.1	78.8	101.4	79.7	51.3	54.0
Forest rangers and timber cruisers	3.2	2.9	5.0	7.6	11.5(d)	11.1
Others	38.9	75.9	96.3	72.1	39.8	42.9
Mining, Quarrying	57.3	70.5	65.3	64.6	29.2	32.0
Prospectors	(1.0)	(1.1)	.9	.8	.7(d)	.7
Others	(56.3)	(69.4)	64.4	63.8	28.5	31.3
Not Stated	1.7	11.4	64.7	168.0	–	–

(a) Figures in brackets are backward projections of the same type as the forward projections for 1971 (see footnote in 1971 column), except for "others" where the brackets indicate that the residual is partly based on such backward projections.

(b) The figures for the occupation groups are based on the formula

$$\frac{X_{71} - X_{61}}{X_{61}} \times \frac{(X_{70} - X_{61})^{10/9}}{(X_{61})}$$

where X_t refers to the number in year t and X_{70} is obtained from the B projection in Chapter 4. Based on this 1952-63-70 projection of of industry structure.

(c) The figures for the occupation groups are obtained from the B projection in Chapter 4, and the figures for the formula

$$\frac{X_{70} - X_{61}}{X_{61}} \quad \frac{(X_{71} - X_{61})^{9/10}}{(X_{61})}$$

(d) Logarithmic projection. It should be noted be noted in the breakdown of occupation groups into classes that the trends of labour force figures were used to project employment without any adjustment for unemployment. In those occupation classes where unemployment is more than negligible when overall unemployment is 3 per cent, the 1970 projections are likely to be overestimates, leading to an equivalent underestimation of the 1970 projection of the non-comparable classes in the affected occupation groups.

(e) Projection of per cent of the total labour force.

(f) Projection of per cent of the occupation group.

(g) Judek's projection with the assumptions of comprehensive medicare and annual net immigration of 50,000.

(h) Projection of ratio to physicians and surgeons.

(i) Projection of ratio to physicians, surgeons and dentists.

(j) Projection of ratio of teachers to population 5-14 years of age applied to the Kasahara population projection.

(k) These figures are obtained by applying the 1961 ratio of elementary to secondary school teachers (source: D.B.S., Preliminary Statistics of Education, 1960-61) to the 1961 Census figure for all school teachers.

(l) These figures are obtained by projecting the ratio of elementary school teachers per capita of elementary-school-age population (6-13 years) to secondary school teachers per capita of secondary-school-age population (14-17 years) for 1955, 1960, 1961, 1962 and 1963 to 1970 and applying it to the projected ratio of elementary to secondary school age population and to the projection for all school teachers for 1970.

(Sources: D.B.S., Preliminary Statistics of Education; Y. Kasahara et al., Population and Labour Force Projections to 1970, Economic Council of Canada, Staff Study No. 1, December 1964.)

Attrition

The next step was to determine the number of labour force entrants required between 1961 and 1970 in order to satisfy the occupation-class projections for 1970. This made it necessary not only to compute the required net growth but also to make a projection of attrition. The latter was projected on the rather crude assumption that the attrition rate in any occupation is determined solely by its age-sex structure, and that the age-sex-specific attrition rates are the same for all occupation groups. In other words, attrition due to deaths and withdrawals from the labour force is taken in account, but its distribution between the occupations is assumed to be related only to the age-sex structure of each occupation. This is necessary because we do not know much about deaths and retirements by occupation. The assumption also implies zero net movements between occupations. This latter assumption is probably not very realistic. For example, many managers come out of other occupations. This means that the attrition in the managerial group will probably be somewhat less than will be estimated by this method of projection, while it will be slightly more for most other groups.

Emigration is not included in attrition. Instead it is subsumed in net immigration which represents part of the required new entrants. According to the

Kasahara projection, gross manpower immigration amounts to about 20% of the required entrants projected in this study, manpower emigration 14% and net manpower immigration, therefore, 6%.[5] As long as emigration is reasonably close in its skill structure to that of immigration, the skill structure of gross immigration will reflect that of net immigration. If, however, emigration is more concentrated in the higher skills than immigration, the structure of net immigration will contain relatively fewer higher skills than the structure of gross immigration.

The projected attrition rates are based on 1) the age-sex structure of the occupation classes in 1961, 2) the projected death rates for the various age-sex groups in 1961-70, and 3) the projected rates of reduction of the 1961 labour force cohort groups between 1961 and 1970. See Table 13. The attrition rates of the respective age-sex groups are taken to be the projected death rates in the younger age-sex groups—44 and under—where the projected reduction rates or net attrition rates of the labour force cohort groups are negative (i.e., the cohort groups are growing at less than the projected death rates). In the older age-sex groups the (gross) attrition rates are taken to be the net attrition rates, since net attrition will be the addition of deaths and dropouts. For a fuller explanation of the method of calculating attrition rates see footnotes to Table 13.

A special problem arises here in the case of women. The female participation rate declines in the 20's of the age profile, increases subsequently and declines again after 50 years of age, giving negative net attrition rates for the middle age groups. There is a significant number of women who drop out of the labour force in their 20's and re-enter it in their 30's or 40's. If these dropouts and re-entries are treated in the same way as permanent dropouts and permanent entries, the statistical results obtained would contain a distortion because they are based on the assumption that all entrants have to be educated from the beginning. This would mean that it is assumed that the re-entrants have to repeat their complete education. To avoid this effect the female age groups have been combined into three age groups of 14-44, 45-54, 55 and over, so as to convert the bi-modal participation-age distribution into a uni-modal one. By this method the attrition net of re-entry is given.

[5] The overall participation rate of new immigrants is about 50%. It is assumed that the same applies to emigrants. This figure is then applied to the totals for immigration, which are based on actual figures of gross immigration for 1961-63, the Kasahara projection of gross immigration for 1964-70 and the Kasahara estimate of emigration for the whole period. (See Y. Kasahara, "Population Projections to 1970", *Population and Labour Force Projections to 1970*, F.T. Denton et al., Economic Council of Canada, Staff Study No. 1, December 1964, Queen's Printer, Ottawa, (1965), pp. 5-7.) In this way the contribution of immigration to the labour force is projected. A revision on the basis of gross immigration observed in recent years might increase the above ratio of net manpower immigration to labour force entrants of 6% to as much as twice that figure.

TABLE 13

Attrition Rates by Age – Sex Groups

Age in 1961	Labour Force[1] '000 1961	Labour Force[1] '000 1970	9-years Net Attrition Rates % of 1961 Size	Deaths in Cohort Group as % of Its 1961 Size[3]	Estimated Gross Attrition Rate %
Men					
14-19	361	807.6	- 123.7	1.2	1.2
20-24	510	620.0	- 21.6	1.8	1.8
25-34	1,154	1,191.4	- 3.2	2.3	2.3
35-44	1,120	1,067.2	+ 4.7	6.7	6.7
45-54	894	734.5	+ 17.8	16.7	17.8
55-over	741	248.9	+ 66.4	41.6	66.4
Women					1.8
14-44	1,267	1,465.4	- 15.7	1.8	9.1
45-54	291	288.8	+ .8	9.1	53.5
55-over	184	85.6	+ 53.5	28.7	

(1) Frank T. Denton and Sylvia Ostry, "Labour Force Projections To 1970", Population and Labour Force Projections To 1970, Economic Council of Canada, Staff Study No. 1, 1964, p. 38

(2) The 1970 size of the respective cohort groups was obtained by aging each cohort group by 9 years (e.g., the group 14-19 years old in 1961 will be 23-28 years old in 1970), and by getting the size of the aged groups from the Denton-Ostry age structure of the 1970 Labour Force, with the help of the assumption that in each age group the number of persons is distributed equally among the individual years of age within the age group.

(3) These figures were computed according to the following procedure. The size of each cohort group was obtained for 1966 from Denton and Ostry (see footnote 1). The average annual dealth rate of each cohort group in 1966 was obtained from Yoshiko Kasahara, "Population Projections to 1970", Population and Labour Force Projections to 1970, Economic Council of Canada, Staff Study No. 1, 1964, p. 18. The deaths in 1966 were obtained by multiplying the two variables. It was then assumed that the lower number of deaths after 1966 would more or less offset each other and that the number of deaths in 1966 can be taken to be the average for 1961-70. Thus the total number of the deaths for each cohort group in that period is obtained by multiplying the 1966 estimate by 9. This figure was then converted into per cent of the 1961 size of each cohort group.

Required Entrants by Comparable Occupation Classes and Educational Qualifications

The occupation classes had to be divided into two groups, those which are comparable between the various Census years and those which are not. The reason is that trends could be worked out for the comparable occupation classes,[6] whereas this was not possible for the non-comparable classes.

After computing the age-sex structure of attrition rates, over the 9-year period following 1961, the attrition in each comparable occupation class was obtained by multiplying the structure of attrition rates by the 1961 age-sex structure of the occupation class. These attrition projections were then added to the net growth of the respective occupation classes required to satisfy the occupation-class projections for 1970. (See Table 14.) The net growth figures represent the subtraction of the numerical distribution of the 1961 labour force from the projected 1970 employment distribution. Allowance for the projected 3 per cent unemployment will be made at a later stage. The addition of the occupation structures of net growth and attrition represents the occupation structure of required entrants.

[6] See the study *Manpower in Canada 1931 to 1961 — Historical Statistics of the Canadian Labour Force*, Department of Manpower and Immigration, for a discussion of the comparison of occupational data over time.

TABLE 14

Required New Entrants by Comparable Occupation Classes
('000)

	Net Growth[1]	Estimated Attrition	Required New Entrants[2]
Professional			
Architects	1.9	.4	2.3
Artists (except comm.), art teachers	2.1	.4	2.5
Artists, commercial	1.7	.5	2.2
Authors, editors, journalists	10.1	1.8	11.9
Clergymen and priests	—.3	4.5	4.2
Dentists	2.4	1.4	3.7
Engineers			
Chemical	.2	.3	.5
Civil	4.3	1.4	5.6
Electrical	3.4	1.0	4.4
Mechanical	4.5	1.4	5.9
Judges and magistrates	.3	.4	.8
Lawyers and notaries	3.7	2.3	6.0
Librarians	2.0	.5	2.5
Musicians and music teachers	3.5	1.9	5.4
Nurses — graduate	49.9	5.2	55.1
Nurses-in-training	11.4	.5	11.9
Osteopaths and chiropractors	.4	.2	.6
Physicians and surgeons	10.9	3.7	14.5
Professors and college principals	11.8	1.6	13.4
Actuaries and statisticians	5.0	.3	5.3
Photographers	.3	.4	.7
Teachers, school	32.9	17.4	50.3
Elementary	—.3	12.7[3]	12.4
Secondary	33.2	4.8[3]	37.9
Veterinarians	—.5	.2	—.3
Clerical			
Attendants, doctors' and dentists' offices	2.1	.3	2.3
Office appliance operators	41.2	1.2	42.4
Shipping and receiving clerks	7.2	8.0	15.1
Stenographers, typists and clerks-typists	104.9	12.7	117.6
Commercial and financial			
Firemen	4.8	1.4	6.2
Advertising agents	2.2	.4	2.6
Auctioneers	—	.1	.1
Brokers, agents, appraisers, n.e.s.	3.5	.9	4.4
Inspectors, graders, samplers, n.e.s.	.7	.7	1.4
Purchasing agents and buyers	.7	2.3	3.1
Sales clerks and service station attendants	83.6	24.0	107.5
Window decorators and dressers	2.0	.4	2.4
Manufacturing and mechanical			
Millers — flour, grain	.2	.4	.6
Other occupations in tobacco products	.4	.4	.7
Tire and tube builders	—.9	.2	—.7

TABLE 14 (Cont'd)

	Net Growth[1]	Estimated Attrition	Required New Entrants[2]
Vulcanizers	1.0	–	1.0
Shoemakers and repairers – factory, n.e.s.	3.1	1.1	4.2
Shoemakers and repairers, n.i.f.	–1.0	1.5	.4
Weavers – textile	–2.1	.4	–1.7
Dressmakers and seamstresses, n.i.f.	4.8	3.2	8.0
Sawyers – wood	–2.1	1.9	–.2
Upholsterers	1.5	.8	2.3
Bookbinders	1.7	.4	2.1
Other occupations in bookbinding, n.e.s.	.7	.2	.9
Compositors and typesetters	1.1	1.1	2.2
Inspectors, examiners, gaugers – metal, n.e.s.	3.9	2.2	6.1
Blacksmiths, hammermen, foremen	–2.9	1.5	1.4
Engravers, except photoengravers	–	.1	.2
Filers, grinders, sharpeners	–.6	1.1	.6
Fitters and assemblers, metal, n.e.s.	.4	2.3	2.7
Heat treaters, annealers, temperers	.3	.9	.5
Mechanics and repairmen, automobile	28.8	9.3	38.1
Mechanics and repairmen, airplane	5.1	.7	5.8
Mechanics and repairmen, railroad-carshop	–1.6	1.4	–.3
Millwrights	3.5	1.8	5.3
Caremakers	–.4	.2	–.2
Pattermakers	.4	.3	.7
Polishers and buffers, metal	–.5	.4	–.1
Riveters and rivet heaters	–.8	.2	–.7
Rolling mill men, n.e.s.	1.1	.4	1.5
Sheetmetal workers and tinsmiths	4.6	2.0	6.5
Toolmakers, die makers and setters	3.1	1.5	4.6
Welders and flame cutters	24.9	4.0	28.9
Stone cutters and dressers	.1	.3	.3
Photographic occupations, n.e.s.	2.4	.2	2.6
Boiler firemen	–2.3	1.7	–.6
Motormen (vehicle) except railway	.8	.3	1.1
Power station operators	2.1	.7	2.8
Stationary engineers	9.4	6.9	16.4
Construction			
Forement	9.0	3.5	12.5
Inspectors	6.6	.8	7.5
Brick and stone masons, cement and concrete finishers	9.6	3.1	12.8
Carpenters	–7.4	23.4	16.0
Painters, decorators and glaziers	6.3	8.4	14.7
Plasterers and lathers	1.4	1.0	2.4
Plumbers and pipe fitters	10.5	4.6	15.1
Labourers	8.2	45.1	53.3
Transportation and communication			
Agents-ticket, station, express	2.6	1.3	3.9
Air pilots and navigators (civil)	3.5	.2	3.7
Baggagemen and expressmen	–.1	.4	–.3
Brakemen – railway and switchmen, signal men, flagmen	–5.8	1.5	–4.3
Captains, mates, pilots and engineering officers on ships	1.1	1.6	2.6
Bus drivers	7.5	2.6	10.1
Chauffeurs and taxi drivers	1.1	3.6	4.7
Conductors – steam railway	–.4	1.5	1.0
Locomotive engineers	–1.3	1.9	.6
Locomotive firemen	–1.8	.3	–1.4
Longshoremen, stevedores, dock labourers	2.9	2.1	5.0
Operators – electric, street railway	–1.3	.2	–1.7
Sectionmen and trackmen	–10.0	5.3	–4.7
Linemen and servicemen	12.2	2.4	14.7
Postmen and mail carriers	5.2	2.2	8.4
Radio announcers, broadcasters	1.0	.1	1.0
Telegraph operators	1.8	.6	–1.2
Telephone operators	4.3	2.8	7.1
Service			
Personal			
Barbers, hairdressers, manicurists	11.9	5.5	17.4
Charworkers and cleaners, janitors and sextons	67.4	28.0	95.4
Cleaners, dyers, launderers	5.9	3.5	9.4
Elevator tenders	–	1.4	1.4
Guides	1.0	.5	1.4
Nurses, practical	67.6	6.9	74.5
Porters	–.2	.8	.6
Undertakers	.4	.5	.9
Waiters and waitresses	36.5	7.2	43.7
Cooks	18.9	8.0	26.9

TABLE 14 (Cont'd)

	Net Growth[1]	Estimated Attrition	Required New Entrants[2]
Protective and other			
Firemen – fire department	7.6	1.6	9.2
Guards, watchmen, caretakers, n.e.s.	11.2	12.7	23.9
Policemen and detectives	11.6	3.4	15.0
Motion picture projectionists	–.4	.4	–
Agriculture			
Farm managers	1.0	.7	1.7
Logging			
Forest rangers and timber cruisers	3.6	1.2	4.8
Mining, quarrying			
Prospectors	–.1	.2	.1

(1) Net growth is the difference between the labour force in 1961 and the employment projection for 1970 for each occupation class in Table 12.

(2) The horizontal additions may involve rounding discrepancies.

(3) Estimated on the basis if the assumption that the age structure of the two groups of school teachers are the same as well as the assumption, applying to the whole table, that age is the only determinant of attrition.

The structure of required educational qualifications in each occupation group could thus be obtained by multiplying the occupation-class structure of required entrants by the specified educational qualifications in Table 11. However, the above method of disaggregating the occupation-group projections into occupation-class projections is limited to those occupation classes which could be quantified on a comparable classification basis in the various Census years. In the case of the non-comparable occupation classes, which amount to over half of the labour force, a different method of projection of the structure of required educational qualifications had to be employed.

Non-Comparable Occupation Classes

In order to project the non-comparable occupation classes, a weighting system had to be developed which would make the structure of non-comparable classes comparable between the Census years without assuming away their heterogeneity. Since it is the structure of educational qualifications which is the final objective of the projections, this structure can also be usefully employed as such a weighting system. Thus in each year and for each occupation group, the addition of the products of 1) the educational qualifications required in the 1960's for the respective non-comparable occupation classes in that group and 2) the size of the classes in the particular year was obtained.

The aggregated education structures obtained by this weighting system made it possible to derive a projection of the education structure of the non-comparable classes in each occupation group. (See Table 15.) An illustration of the method is given below. It is based on the assumption that the future changes in the occupational structure (not in the educational requirements, which are held constant) will follow the pattern of past changes. This means that if the proportion of persons in occupations with a certain set of 1960-70 education requirements have been declining in the past, they will continue to decline, just as the proportion in occupations with other types of educational requirements will change in the same way as they have in the past.

The required net growth of the non-comparable classes by educational qualifications was obtained by subtracting the 1961 vectors of the education structures of the non-comparable classes from the 1970 vectors. After adding attrition, which is estimated in the same way as for the comparable classes, the projection of required new entrants in the non-comparable classes by education is determined. (See Table 18 below.) As in the case of the comparable classes, the projection is preliminary because it still requires a modification to take account of those who did not state their occupations in 1961 and will still be in the labour force in 1970.

TABLE 15

The Non-Comparable Occupation Classes, Weighted by the Educational Qualifications Required in the 1960's, by Occupation Groups, 1931-61 and Projected to 1970(1)

('000)

Required Educational Qualifications		Professional					Clerical					Commercial and Financial				
		1931	1941	1951	1961	1970	1931	1941	1951	1961	1970	1931	1941	1951	1961	1970
Total		51.1	76.7	125.7	229.4	410.0	153.6	176.6	361.9	514.0	725.8	78.0	87.8	135.4	200.0	275.8
Elementary Education	VIII	51.1	76.7	125.7	229.4	410.0	153.6	176.6	361.9	514.0	725.8	72.4	83.8	130.1	192.6	267.5
High School	IX	12.1	14.3	49.4	136.9	300.0(4)	.3	–	–	–	–	31.4	24.5	37.0	54.8	77.2
– Academic	X	12.1	14.3	49.4	136.9	300.0(4)	.3	–	–	–	–	31.4	24.5	37.0	54.8	77.2
	XI	12.1	14.3	49.4	136.9	300.0(4)	.3	–	–	–	–	5.4	3.4	7.9	15.2	27.6
	XII	12.1	14.3	49.4	136.9	300.0(4)	.3	–	–	–	–	5.4	3.4	7.9	15.2	27.6
– Technical	IX	5.4	6.8	21.1	39.7	60.0(4)	–	–	–	–	–	–	–	–	–	–
	X	5.4	6.8	21.1	39.7	60.0(4)	–	–	–	–	–	–	–	–	–	–
	XI	5.4	6.8	21.1	39.7	60.0(4)	–	–	–	–	–	–	–	–	–	–
	XII	5.4	6.8	21.1	39.7	60.0(4)	–	–	–	–	–	–	–	–	–	–
– Commercial	IX	20.2	40.9	38.8	35.8	30.0(4)	47.5	32.1	87.6	193.3	333.8	–	–	–	–	–
	X	20.2	40.9	38.8	35.8	30.0(4)	47.5	32.1	87.6	193.3	333.8	–	–	–	–	–
	XI	20.2	40.9	38.8	35.8	30.0(4)	47.5	32.1	87.6	193.3	333.8	–	–	–	–	–
	XII	20.2	40.9	38.8	35.8	30.0(4)	45.0	32.1	87.6	156.3	261.3	–	–	–	–	–
Trade School	1 yr.	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
	2 yrs.	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
University	General	–	–	3.9	1.1	2.1	–	–	–	–	–	–	–	4.5	8.4	16.5
Degree	Hon. & Prof. (Arts)	–	–	–	8.3	18.5	–	–	–	–	–	5.4	3.4	3.4	5.4	5.5
(Final)(2)	Hon. & Prof. (Science)	6.5	12.2	15.1	39.2	77.9	–	–	–	–	–	–	–	–	–	–
	Postgraduate	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Nursing School	3 yrs.	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Teachers College	1 yr.	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
	2 yrs.	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Technical	1 yr.	2.7	–	20.4	75.9	196.8	–	–	–	–	–	–	–	–	–	–
College and	2 yrs.	2.7	–	20.4	75.9	196.8	–	–	–	–	–	–	–	–	–	–
Vocational	3 yrs.	–	–	1.3	2.5	6.2	–	–	–	–	–	–	–	–	–	–
Institute(3)	4 yrs.	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Apprenticeship	2 yrs.	20.2(5)	40.9(5)	38.8(5)	35.8(5)	30.0(5)	–	–	–	–	–	–	–	–	–	–
	4 yrs.	20.2(5)	40.9(5)	38.8(5)	35.8(5)	30.0(5)	–	–	–	–	–	–	–	–	–	–
	6 yrs.	20.2(5)	40.9(5)	38.8(5)	35.8(5)	30.0(5)	–	–	–	–	–	–	–	–	–	–
Systematic	6 months	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
On-the-job	1 yr.	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Training	2 yrs.	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
	3 yrs.	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
	4 yrs.	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

TABLE 15 *(Cont'd.)*

Required Educational Qualifications		Manufacturing and Mechanical					Construction					Transportation and Communication				
		1931	1941	1951	1961	1970	1931	1941	1951	1961	1970	1931	1941	1951	1961	1970
Total		257.6	408.9	579.2	664.2	905.5	28.7	28.7	44.4	66.2	89.2	108.7	131.3	210.3	286.8	382.0
Elementary Education	VIII	240.4	385.2	542.7	629.0	860.2	28.7	28.7	44.4	66.2	89.2	65.7	96.2	179.8	270.7	382.0
High School	IX	—	—	1.2	—	4.5	—	—	—	—	—	1.4	.8	1.5	2.3	3.8
— Academic	X	—	—	1.2	—	4.5	—	—	—	—	—	1.4	.8	1.5	2.3	3.8
	XI	—	—	1.2	—	4.5	—	—	—	—	—	1.4	.8	1.5	2.3	3.8
	XII	—	—	1.2	—	4.5	—	—	—	—	—	1.4	.8	1.5	2.3	3.8
— Technical	IX	71.1	86.7	190.0	238.4	434.6	24.5	22.1	35.0	46.8	58.9	6.7	7.4	16.8	21.8	30.6
	X	70.1	86.7	190.0	235.1	434.6	24.5	22.1	35.0	46.8	58.9	6.7	7.4	16.8	21.8	30.6
	XI	6.7	9.0	21.4	23.2	39.8	24.5	22.1	35.0	46.8	58.9	.4	1.1	2.5	3.4	5.7
	XII	1.8	1.6	4.6	3.3	4.5	—	—	—	—	—	.4	1.1	2.5	3.4	5.7
— Commercial	IX	—	—	—	—	—	—	—	—	—	—	.3	—	—	3.7	5.7
	X	—	—	—	—	—	—	—	—	—	—	.3	—	—	3.7	5.7
	XI	—	—	—	—	—	—	—	—	—	—	.3	—	—	3.7	5.7
	XII	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Trade School	1 yr.	2.8	4.1	12.2	37.9	81.5	—	—	—	—	—	—	—	—	—	—
	2 yrs.	2.8	4.1	4.1	5.3	9.1	—	—	—	—	—	—	—	—	—	—
University Degree (Final)[2]	General	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Hon. & Prof. (Arts)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Hon. & Prof. (Science)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Postgraduate	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Nursing School	3 yrs.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Teachers College	1 yr.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	2 yrs.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Technical College and Vocational Institute[3]	1 yr.	1.8	1.6	6.4	3.3	9.1	—	—	—	—	—	1.8	1.8	4.2	2.3	1.9
	2 yrs.	1.8	1.6	6.4	3.3	9.1	—	—	—	—	—	1.8	1.8	4.2	2.3	1.9
	3 yrs.	1.8	1.6	4.6	2.0	4.5	—	—	—	—	—	—	—	—	—	—
	4 yrs.	1.0	1.6	2.3	2.0	4.5	—	—	—	—	—	—	—	—	—	—
Apprenticeship	2 yrs.	85.5	157.8	202.1	227.2	307.9	24.1	22.1	35.0	49.2	63.4	12.4	7.6	15.4	20.1	26.7
	4 yrs.	80.6	101.8	167.4	198.6	271.7	25.1	22.1	35.0	49.2	63.4	7.9	7.6	15.4	20.1	26.7
	6 yrs.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Systematic On-the-job Training	6 months	119.3	74.4	253.1	308.2	443.7	3.2	6.6	9.4	17.0	26.8	40.0	78.6	153.1	187.5	282.7
	1 yr.	73.2	65.4	137.9	148.1	190.2	2.3	2.2	1.8	3.5	4.0	40.0	78.6	153.1	160.0	233.0
	2 yrs.	49.2	49.5	108.9	128.9	181.1	2.3	2.2	1.8	3.5	4.0	—	—	—	—	—
	3 yrs.	46.9	49.5	91.5	112.9	163.0	—	—	—	—	—	—	—	—	—	—
	4 yrs.	46.9	49.5	91.5	112.9	163.0	—	—	—	—	—	—	—	—	—	—

TABLE 15 *(Cont'd).*

Required Educational Qualifications		Service					Agricultural					Fishing, Trapping, Hunting				
		1931	1941	1951	1961	1970	1931	1941	1951	1961	1970	1931	1941	1951	1961	1970
Total		199.0	237.1	149.5	221.6	254.2	1,124.6	1,080.7	826.5	645.6	549.7	47.7	51.5	53.0	37.0	22.0
Elementary Education	VIII	51.0	73.1	40.8	62.7	73.7	642.2	645.2	558.7	421.6	373.8	–	–	–	–	–
High School	IX	1.4	2.3	1.9	9.5	17.8	–	–	–	–	–	–	–	–	–	–
– Academic	X	1.4	2.3	1.9	9.5	17.8	–	–	–	–	–	–	–	–	–	–
	XI	1.4	2.3	1.9	9.5	17.8	–	–	–	–	–	–	–	–	–	–
	XII	1.4	2.3	1.9	9.5	17.8	–	–	–	–	–	–	–	–	–	–
– Technical	IX	–	–	–	.4	1.3	642.2	645.2	558.7	421.6	373.8	–	–	–	–	–
	X	–	–	–	.4	1.3	642.2	645.2	558.7	421.6	373.8	–	–	–	–	–
	XI	–	–	–	–	–	642.2	645.2	558.7	421.6	373.8	–	–	–	–	–
	XII	–	–	–	–	–	642.2	645.2	558.7	421.6	373.8	–	–	–	–	–
– Commercial	IX	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
	XI	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
	XII	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Trade School	1 yr.	–	–	–	9.8	12.7	–	–	–	–	–	–	–	–	–	–
	2 yrs.	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
University	General	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Degree	Hon. & Prof. (Arts)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
(Final)[2]	Hon. & Prof. (Science)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
	Postgraduate	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Nursing School	3 yrs.	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Teachers College	1 yr.	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
	2 yrs.	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Teachnical	1 yr.	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
College and	2 yrs.	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Vocational	3 yrs.	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Institute[3]	4 yrs.	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Apprenticeship	2 yrs.	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
	4 yrs.	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
	6 yrs.	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Systematic	6 months	–	–	–	3.5	5.1	–	–	–	–	–	–	–	–	–	–
On-the-job	1 yr.	–	–	–	3.5	5.1	–	–	–	–	–	–	–	–	–	–
Training	2 yrs.	–	–	–	3.5	5.1	–	–	–	–	–	–	–	–	–	–
	3 yrs.	–	–	–	.4	1.3	–	–	–	–	–	–	–	–	–	–
	4 yrs.	–	–	–	.4	1.3	–	–	–	–	–	–	–	–	–	–

TABLE 15 *(Cont'd.)*

Required Educational Qualifications		Logging					Mining and Quarrying				
		1931	1941	1951	1961	1970	1931	1941	1951	1961	1970
Total		38.9	75.9	96.3	72.1	42.9	56.3	69.4	64.4	63.8	31.3
Elementary Education	VIII	.9	1.4	3.8	5.9	5.1	36.4	53.6	42.3	44.1	26.0
High School	IX	–	–	–	–	–	–	–	–	–	–
– Academic	X	–	–	–	–	–	–	–	–	–	–
	XI	–	–	–	–	–	–	–	–	–	–
	XII	–	–	–	–	–	–	–	–	–	–
– Technical	IX	–	–	–	–	–	3.6	7.9	11.7	12.8	7.5
	X	–	–	–	–	–	3.6	7.9	11.7	12.8	7.5
	XI	–	–	–	–	–	2.1	2.7	6.4	7.6	4.4
	XII	–	–	–	–	–	2.1	2.7	6.4	7.6	4.4
– Commercial	IX	–	–	–	–	–	–	–	–	–	–
	X	–	–	–	–	–	–	–	–	–	–
	XI	–	–	–	–	–	–	–	–	–	–
	XII	–	–	–	–	–	–	–	–	–	–
Trade School	1 yr.	–	–	–	–	–	–	–	–	–	–
	2 yrs.	–	–	–	–	–	–	–	–	–	–
University	General	–	–	–	–	–	–	–	–	–	–
Degree	Hon. & Prof. (Arts)	–	–	–	–	–	–	–	–	–	–
(Final)[2]	Hon. & Prof. (Science)	–	–	–	–	–	–	–	–	–	–
	Postgraduate	–	–	–	–	–	–	–	–	–	–
Nursing School	3 yrs.	–	–	–	–	–	–	–	–	–	–
Teachers College	1 yr.	–	–	–	–	–	–	–	–	–	–
	2 yrs.	–	–	–	–	–	–	–	–	–	–
Technical	1 yr.	–	–	–	–	–	2.1	2.7	4.8	5.6	3.1
College and	2 yrs.	–	–	–	–	–	2.1	2.7	4.8	5.6	3.1
Vocational	3 yrs.	–	–	–	–	–	–	–	–	–	–
Institute[3]	4 yrs.	–	–	–	–	–	–	–	–	–	–
Apprenticeship	2 yrs.	–	–	–	–	–	–	–	–	–	–
	4 yrs.	–	–	–	–	–	–	–	–	–	–
	6 yrs.	–	–	–	–	–	–	–	–	–	–
Systematic	6 months	–	–	–	–	–	2.8	3.4	9.7	3.4	1.9
On-the-job	1 yr.	–	–	–	–	–	–	–	–	–	–
Training	2 yrs.	–	–	–	–	–	–	–	–	–	–
	3 yrs.	–	–	–	–	–	–	–	–	–	–
	4 yrs.	–	–	–	–	–	–	–	–	–	–

[1] Unless otherwise indicated, the projection is the extrapolation of the *percentage* structure.
[2] The university degrees refer only to the highest degree and not to prerequisite degrees, because these are alternative sequences possible in obtaining the higher degrees.
[3] Includes chiropractor college, art school and navigational schooling.
[4] Obtained from a projection of those with *only* elementary education and the subsequent disaggregation of the residual.
[5] Articling for the C.A. and R.I.A. diplomas.

To illustrate the above method in a concrete way, it is explained for the transportation and communications occupation group. According to Table 12, in 1970 there will be 382,000 employment opportunities for people in transportation and communications occupations which do not have intercensal comparability. Hypothetical education structures for each Census year were then constructed by applying the 1961-1970 educational requirements in Table 11 to the numbers in the respective non-comparable occupation classes in the *current* Census year from the "others" rows in Table 12. They are given in Table 15. They are hypothetical in that they represent the structures which *would* have prevailed *if* the educational requirements current in the 1960's had been appropriate in the earlier Census years. Thus, in Table 15, there are in 1931, 1.8 thousand with post-secondary technical education in transportation and communications occupations, even though at that time there was no such technical education. It merely means that occupations *now* requiring technical institute education amounted to 1.8 thousand in 1931. In other words, the occupation classes were grouped according to their present educational requirements and were thus made comparable among the Census years. The projection of technical institute education for 1970 of 1.9 thousand and a negative net growth of 0.4 thousand between 1961 and 1970 indicates that the relevant group of occupations is declining, i.e., entrants into the non-comparable transportation and communications occupations, with graduation from a technical institute, will have to cover less than the attrition in this group between 1961 and 1970.

Managers

In the case of the proprietary and managerial occupations a problem more severe than that of the non-comparable classes was encountered. The classification of managers is primarily industrial and its categories lack any semblance of homogeneity in educational qualifications. Consequently, the managers were omitted from the list of the specifications of required educational qualifications and the method of projecting educational requirements that was used is that of the projection of the *observed* educational structure. (See Table 16).

TABLE 16

Educational Structure of Owners and Managers, 1941-61, and Projected to 1970

	Per Cent					Numbers '000	
Completed at Least	1941	1946[1]	1951	1961	1970[2]	Labour Force in 1961	Employment in 1970[2]
Grade V	92.9	94	95.7	96.8	98.6[3]	484.9	690.0
Grade VIII	...	82	...	90[1]	95.4[3]	450.8	668.1
Grade IX	56.9	62	66.5	73.6	80	368.7	560.0
Grade X	...	52	...	64[1]	71	320.6	497.0
Grade XI	...	41	...	53.2	62	266.5	434.0
Grade XII	...	29	...	41.4	52	207.4	364.0
Grade XIII	12.2	...	18.1	27.3	38	....	....
Some University	...	...	...	15.1	...	....	....
University Degree	...	3	...	7.6	15	38.1	105.0
Total owners and managers	100.0	100	100.0	100.0	100.0	500.9	700.0

[1] Estimated by interpolation.
[2] Projected by extrapolation.
[3] Based on the assumption that all entrants into the managerial labour force after 1961 must at least have completed elementary education.

One exception to this method is the assumption that all new entrants into proprietary and managerial occupations after 1961 will be required to have at least elementary education. From the difference between the projected educational structure for 1970 and the observed structure in 1961, the educational structure of the net growth of owners and managers is obtained. (See Table 17.)

TABLE 17

Required Entrants Into Managerial Labour Force, 1961-70
'000

Completed at Least	1961	1970	Net Growth	Attrition[1]	Required Entrants[2]
Grade V	484.9	690.0	205.2	95.2	300.3
Grade VIII	450.8	668.1	217.3	83.0	300.3
Grade IX	368.7	553.0	184.3	62.8	247.1
Grade X	320.6	497.0	176.4	52.6	229.1
Grade XI	266.5	434.0	167.5	41.5	209.0
Grade XII	207.4	364.0	156.6	29.4	186.0
University Degree	38.1	105.0	66.9	3.0	70.0
Total Managers	500.9	700.0	199.1	101.2	300.3

[1] Based on estimated educational distribution for 1946.
[2] There may be rounding discrepancies in the arithmetic operations of each row.

The projection of the educational structure of the attrition of owners and managers posed a particularly difficult problem. Since the educational qualifications of succeeding generations of managers increase, the retiring managers cannot be assumed to randomly come from the prevailing educational structure of managers. Rather they will reflect the educational structure specific to an older generation of managers. To take this effect into account, the profiles of the numbers of managers that respective cohort groups provided over the various Census years were ascertained, and from them, it was estimated that the average occupational lifetime of managers has been 34 years. This means that managers leaving the labour force (or the occupation) in 1961-70 will have entered it around 1927-36, that is, their entries will be scattered around the mean year 1931-32, assuming that the occupational lifetime of managers has remained fairly constant over time.

If the managerial labour force was not subject to growth, it could be said that the median occupational age (i.e., the median number of years spent in the occupation) of those retiring in 1961-70 will be the same as the median of the overall occupational age distribution in 1948-49– that is to say, half-way between the mid-point of 1927-36 and that of 1961-70. At that point, the number of managers who are older than the 1961-70 retiring group will be equal to the number of managers who are younger. Consequently, if it can be assumed that the improvement in educational qualifications has proceeded along a gradual linear trend over time–which is largely supported by the available data–then the educational superiority of the younger managers over the 1961-70 retiring group will be offset by the educational inferiority of the older managers and the average educational qualifications of all managers in 1948-49 will coincide with the average educational qualifications of the 1961-70 retiring group. While the dispersion of the overall distribution may be greater than the dispersion of the 1961-70 retiring group, since the latter may be largely concentrated in the median range, this problem will be regarded as negligible on the basis of the assumptions that the educational qualifications of each group of entrants is fairly diverse and that the same applies to their occupational life spans. Thus, the percentage distribution of the educational qualifications of all managers in 1948-49 could be assumed to be the same as that of the 1961-70 retiring group.

However, this construct depends on the assumption of zero net growth of the managerial labour force. If the latter is increasing, the number of younger managers will be somewhat greater than the number of older managers at the half-way point between 1927-36 and 1961-70. Consequently, equality between the two groups will be achieved before 1948-49. As a crude solution, it has accordingly been assumed that the percentage educational distribution of the 1961-70 retiring group will be approximately equal to that of all managers at the half-way point between the 1941 and 1951 Censuses. This distribution was estimated by interpolation. (See Table 16 above.) After having thus obtained the percentage education structure of the 1961-70 dropouts from the managerial labour force the required replacement of manpower by educational qualifications could be estimated by applying this distribution to the estimated overall attrition of managers.

TABLE 18

Preliminary Projection of Required Labour Force Entrants, 1961-70, by Occupation Groups and Educational Qualifications

Required Educational Qualifications			Proprietary and Managerial	Professional					Clerical				
			Total Required Entrants	Comparable Classes	Non-Comparable			Total Required Entrants	Comparable Classes	Non-Comparable			Total Required Entrants
				Required Entrants	Net Growth	Estimated Attrition	Required Entrants		Required Entrants	Net Growth	Estimated Attrition	Required Entrants	
Total			300.3	209.7	180.7	27.6	208.2	417.9	177.5	211.8	52.8	264.5	442.0
Elementary Education		VIII	300.0	209.7	180.7	27.7	208.2	417.9	177.5	211.8	52.8	264.5	442.0
High School		IX	247.1	209.0	163.1	5.1	168.2	377.2	42.4	–	–	–	42.4
– Academic		X	229.1	209.0	163.1	5.1	168.2	377.2	42.4	–	–	–	42.4
		XI	209.0	209.0	163.1	5.1	168.2	377.2	–	–	–	–	–
		XII	186.0	209.0	163.1	5.1	168.2	377.2	–	–	–	–	–
– Technical		IX	–	.7	20.3	2.5	27.8	28.5	–	–	–	–	–
		X	–	.7	20.3	2.5	27.8	28.5	–	–	–	–	–
		XI	–	.7	20.3	2.5	27.8	28.5	–	–	–	–	–
		XII	–	.7	20.3	2.5	27.8	28.5	–	–	–	–	–
– Commercial	IX	IX	–	–	5.8	14.7	8.9	8.9	132.8	140.6	9.6	150.2	282.9
		X	–	–	5.8	14.7	8.9	8.9	132.8	140.6	9.6	150.2	282.9
		XI	–	–	5.8	14.7	8.9	8.9	117.6	140.6	9.6	150.2	267.8
		XII	–	–	5.8	14.7	8.9	8.9	117.6	105.0	9.6	114.6	232.2
Trade School		1 yr.	–	–	–	–	–	–	–	–	–	–	–
		2 yrs.	–	–	–	–	–	–	–	–	–	–	–
University Degree (Final)		General	70.0	59.4	.9	–	.9	60.3	–	–	–	–	–
		Hon. & Prof. (Arts)	–	9.2	10.2	–	10.2	19.4	–	–	–	–	–
		Hon. & Prof. (Science)	–	36.8	38.7	4.4	43.1	79.9	–	–	–	–	–
		Postgraduate	–	13.4	–	–	–	13.4	–	–	–	–	–
Nursing School		3 yrs.	–	55.1	–	–	–	55.1	–	–	–	–	–
Teachers College		1 yr.	–	50.3	–	–	–	50.3	–	–	–	–	–
		2 yrs.	–	12.4	–	–	–	12.4	–	–	–	–	–
Technical College and Vocational Institute		1 yr.	–	6.1	120.9	–	120.9	126.9	–	–	–	–	–
		2 yrs.	–	6.1	120.9	–	120.9	126.9	–	–	–	–	–
		3 yrs.	–	.6	3.6	–	3.6	4.2	–	–	–	–	–
		4 yrs.	–	.6	–	–	–	.6	–	–	–	–	–
Apprenticeship		2 yrs.	–	–	-5.8	14.7	8.9	8.9	–	–	–	–	–
		4 yrs.	–	–	-5.8	14.7	8.9	8.9	–	–	–	–	–
		6 yrs.	–	–	-5.8	14.7	8.9	8.9	–	–	–	–	–
Systematic On-the-job Training		6 months	–	–	–	–	–	–	–	–	–	–	–
		1 yr.	–	–	–	–	–	–	–	–	–	–	–
		2 yrs.	–	–	–	–	–	–	–	–	–	–	–
		3 yrs.	–	–	–	–	–	–	–	–	–	–	–
		4 yrs.	–	–	–	–	–	–	–	–	–	–	–

TABLE 18 *(Cont'd)*

Required Educational Qualifications		Commercial and Financial					Manufacturing and Mechanical				
		Comparable Classes	Non-Comparable			Total Required Entrants	Comparable Classes	Non-Comparable			Total Required Entrants
		Required Entrants	Net Growth	Estimated Attrition	Required Entrants		Required Entrants	Net Growth	Estimated Attrition	Required Entrants	
Total		127.6	75.8	26.5	102.4	230.0	141.2	241.3	90.1	331.4	472.6
Elementary Education	VIII	127.6	75.0	25.3	100.3	228.0	141.2	231.2	84.9	316.1	457.3
High School	IX	9.5	22.4	7.4	29.8	39.3	—	4.5	—	4.5	4.5
— Academic	X	9.5	22.4	7.4	29.8	39.3	—	4.5	—	4.5	4.5
	XI	9.4	12.4	1.0	13.4	22.8	—	4.5	—	4.5	4.5
	XII	9.4	12.4	1.0	13.4	22.8	—	4.5	—	4.5	4.5
— Technical	IX	1.4	—	—	—	1.4	116.8	196.2	19.1	215.3	332.0
	X	1.4	—	—	—	1.4	113.0	199.5	19.1	218.6	331.6
	XI	1.4	—	—	—	1.4	40.7	16.6	2.0	18.6	59.3
	XII	1.4	—	—	—	1.4	27.2	1.2	.4	1.6	28.8
— Commercial	IX	9.2	—	—	—	9.2	—	—	—	—	—
	X	9.2	—	—	—	9.2	—	—	—	—	—
	XI	9.2	—	—	—	9.2	—	—	—	—	—
	XII	3.1	—	—	—	3.1	—	—	—	—	—
Trade School	1 yr.	—	—	—	—	—	2.0	43.6	.9	44.5	46.6
	2 yrs.	—	—	—	—	—	1.6	3.7	.9	4.6	6.2
University	General	2.6	8.2	—	8.2	10.7	—	—	—	—	—
Degree	Hon. & Prof. (Arts)	—	.2	1.0	1.2	1.2	—	—	—	—	—
(Final)	Hon. & Prof. (Science)	—	—	—	—	—	—	—	—	—	—
	Postgraduate	—	—	—	—	—	—	—	—	—	—
Nursing School	3 yrs.	—	—	—	—	—	—	—	—	—	—
Teachers College	1 yr.	—	—	—	—	—	—	—	—	—	—
	2 yrs.	—	—	—	—	—	—	—	—	—	—
Technical	1 yr.	3.8	—	—	—	3.8	6.1	5.7	.4	6.1	12.2
College and	2 yrs.	3.8	—	—	—	3.8	6.1	5.7	.4	6.1	12.2
Vocational	3 yrs.	2.4	—	—	—	2.4	—	2.5	.4	2.9	2.9
Institute	4 yrs.	—	—	—	—	—	—	2.5	.4	2.9	2.9
Apprenticeship	2 yrs.	—	—	—	—	—	111.4	80.7	34.8	115.5	226.8
	4 yrs.	—	—	—	—	—	110.3	73.1	22.4	95.5	205.8
	6 yrs.	—	—	—	—	—	16.4	—	—	—	16.4
Systematic	6 months	—	—	—	—	—	22.8	135.5	16.4	151.9	174.7
On-the-job	1 yr.	—	—	—	—	—	17.3	42.0	14.4	66.5	83.7
Training	2 yrs.	—	—	—	—	—	4.7	52.3	10.9	63.2	67.9
	3 yrs.	—	—	—	—	—	—	50.1	10.9	61.0	61.0
	4 yrs.	—	—	—	—	—	—	50.1	10.9	61.0	61.0

TABLE 18 *(Cont'd.)*

Required Educational Qualifications		Construction					Labourers	Transportation and Communications				
		Comparable Classes	Non-Comparable			Total Required Entrants	Total Required Entrants	Comparable Classes	Non-Comparable Classes			Total Required Entrants
		Required Entrants	Net Growth	Estimated Attrition	Required Entrants			Required Entrants	Net Growth	Estimated Attrition	Required Entrants	
Total		81.0	23.1	7.6	30.7	111.6	53.3	49.6	95.2	29.6	124.8	174.4
Elementary Education	VIII	81.0	23.1	7.6	30.7	111.6	–	44.9	111.3	21.7	133.0	177.9
High School	IX	–	–	–	–	–	–	44.9	1.5	.2	1.7	46.6
– Academic	X	–	–	–	–	–	–	44.9	1.5	.2	1.7	46.6
	IX	–	–	–	–	–	–	10.7	1.5	.2	1.7	12.4
	XII	–	–	–	–	–	–	4.7	1.5	.2	1.7	6.4
– Technical	IX	53.5	12.1	5.9	18.0	71.4	–	12.7	8.8	1.7	10.4	23.2
	X	31.5	12.1	5.9	18.0	53.0	–	2.6	8.8	1.7	10.4	13.1
	XI	20.0	12.1	5.9	18.0	37.9	–	2.6	2.3	.2	2.5	5.2
	XII	20.0	–	–	–	20.0	–	2.6	2.3	.2	2.5	5.2
– Commercial	IX	–	–	–	–	–	–	3.9	2.8	–	2.0	5.9
	X	–	–	–	–	–	–	3.9	2.0	–	2.0	5.9
	XI	–	–	–	–	–	–	–	2.0	–	2.0	2.0
	XII	–	–	–	–	–	–	–	–	–	–	–
Trade School	1 yr.	–	–	–	–	–	–	–	–	–	–	–
	2 yrs.	–	–	–	–	–	–	–	–	–	–	–
University	General	–	–	–	–	–	–	–	–	–	–	–
Degree	Hon. & Prof. (Arts)	–	–	–	–	–	–	–	–	–	–	–
(Final)	Hon. & Prof. (Science)	–	–	–	–	–	–	–	–	–	–	–
Nursing School	3 yrs.	–	–	–	–	–	–	–	–	–	–	–
Teachers College	1 yr.	–	–	–	–	–	–	–	–	–	–	–
	2 yrs.	–	–	–	–	–	–	–	–	–	–	–
Technical	1 yr.	–	–	–	–	–	–	5.1	–.4	.4	–	5.2
College and	2 yrs.	–	–	–	–	–	–	5.1	–.4	.4	–	5.2
Vocational	3 yrs.	–	–	–	–	–	–	2.6	–	–	–	2.6
Institute	4 yrs.	–	–	–	–	–	–	2.6	–	–	–	2.6
Apprenticeship	2 yrs.	81.0	14.2	5.9	20.1	101.0	–	13.9	6.7	1.7	8.4	22.3
	4 yrs.	81.0	14.2	5.9	20.1	101.0	–	13.9	6.7	1.7	8.4	22.3
	6 yrs.	–	–	–	–	–	–	–	–	–	–	–
Systematic	6 months	20.0	9.8	1.7	8.0	28.0	–	–	95.1	17.7	112.9	112.9
On-the-job	1 yr.	–	.5	.6	1.1	1.1	–	–	73.0	17.7	90.7	90.7
Training	2 yrs.	–	.5	.6	1.1	1.1	–	–	–	–	–	–
	3 yrs.	–	–	–	–	–	–	–	–	–	–	–
	4 yrs.	–	–	–	–	–	–	–	–	–	–	–

TABLE 18 *(Cont'd.)*

Required Educational Qualifications		Services					Agricultural				
		Comparable Classes	Non-Comparable Classes			Total Required Entrants	Comparable Classes	Non-Comparable Classes			Total Required Entrants
		Required Entrants	Net Growth	Estimated Attrition	Required Entrants		Required Entrants	Net Growth	Estimated Attrition	Required Entrants	
Total		319.7	32.7	32.2	64.9	384.6	1.7	−95.5	141.1	45.6	47.3
Elementary Education	VIII	198.4	11.0	10.4	21.3	219.7	1.7	−47.8	84.3	36.5	38.1
High School	IX	33.8	8.3	.2	8.5	42.3	–	–	–	–	–
–Academic	X	33.8	8.3	.2	8.5	42.3	–	–	–	–	–
	XI	1.4	8.3	.2	8.5	9.9	–	–	–	–	–
	XII	1.4	8.3	.2	8.5	9.9	–	–	–	–	–
–Technical	IX	–	.8	–	.8	.8	1.7	−47.8	84.3	36.5	38.1
	X	–	.8	–	.8	.8	1.7	−47.8	84.3	36.5	38.1
	XI	–	–	–	–	–	1.7	−47.8	84.3	36.5	38.1
	XII	–	–	–	–	–	1.7	−47.8	84.3	36.5	38.1
–Commercial	IX	–	–	–	–	–	–	–	–	–	–
	X	–	–	–	–	–	–	–	–	–	–
	XI	–	–	–	–	–	–	–	–	–	–
	XII	–	–	–	–	–	–	–	–	–	–
Trade School	1 yr.	17.4	29.6	–	29.6	47.0	–	–	–	–	–
	2 yrs.	–	–	–	–	–	–	–	–	–	–
University	General	–	–	–	–	–	–	–	–	–	–
Degree	Hon. & Prof. (Arts)	–	–	–	–	–	–	–	–	–	–
(Final)	Hon. & Prof. (Science)	–	–	–	–	–	–	–	–	–	–
	Postgraduate	–	–	–	–	–	–	–	–	–	–
Nursing School	3 yrs.	–	–	–	–	–	–	–	–	–	–
Teachers College	1 yr.	–	–	–	–	–	–	–	–	–	–
	2 yrs.	–	–	–	–	–	–	–	–	–	–
Technical	1 yr.	–	–	–	–	–	–	–	–	–	–
College and	2 yrs.	–	–	–	–	–	–	–	–	–	–
Vocational	3 yrs.	–	–	–	–	–	–	–	–	–	–
Institute	4 yrs.	–	–	–	–	–	–	–	–	–	–
Apprenticeship	2 yrs.	27.8	–	–	–	27.8	–	–	–	–	–
	4 yrs.	.9	–	–	–	.9	–	–	–	–	–
	6 yrs.	–	1.5	–	–	–	–	–	–	–	–
Systematic	6 months	24.2	1.5	–	–	24.2	–	–	–	–	–
On-the-job	1 yr.	24.2	1.5	–	–	24.2	–	–	–	–	–
Training	2 yrs.	–	.9	–	–	–	–	–	–	–	–
	3 yrs.	–	.9	–	–	–	–	–	–	–	–
	4 yrs.	–	–	–	–	–	–	–	–	–	–

TABLE 18 *(Cont'd.)*

Required Educational Qualifications		Fishing, Hunting	Logging					Mining, Quarrying				
		Required Entrants	Comparable Classes	Non-Comparable Classes			Total Required Entrants	Comparable Classes	Non-Comparable Classes			Total Required Entrants
			Required Entrants	Net Growth	Estimated Attrition	Required Entrants		Required Entrants	Net Growth	Estimated Attrition	Required Entrants	
Total		-.9	4.8	-29.2	8.0	-21.2	-16.4	-.1	-32.5	7.9	-24.6	-24.7
Elementary Education	VIII	—	4.8	- .8	.7	- .1	4.7	-.1	-18.1	5.5	-12.6	-12.7
High School	IX	—	—	—	—	—	—	—	—	—	—	—
- Academic	X	—	—	—	—	—	—	—	—	—	—	—
	XI	—	—	—	—	—	—	—	—	—	—	—
	XII	—	—	—	—	—	—	—	—	—	—	—
- Technical	IX	—	—	—	—	—	—	.1	- 5.3	1.6	- 3.7	- 3.6
	X	—	—	—	—	—	—	.1	- 5.3	1.6	- 3.7	- 3.6
	XI	—	—	—	—	—	—	.1	- 3.2	.9	- 2.3	- 2.2
	XII	—	—	—	—	—	—	.1	- 3.2	.9	- 2.3	- 2.2
- Commercial	IX	—	—	—	—	—	—	—	—	—	—	—
	X	—	—	—	—	—	—	—	—	—	—	—
	XI	—	—	—	—	—	—	—	—	—	—	—
	XII	—	—	—	—	—	—	—	—	—	—	—
Trade School	1 yr.	—	4.8	—	—	—	4.8	—	—	—	—	—
	2 yrs.	—	—	—	—	—	—	—	—	—	—	—
University Degree (Final)	General	—	—	—	—	—	—	—	—	—	—	—
	Hon. & Prof. (Arts)	—	—	—	—	—	—	—	—	—	—	—
	Hon. & Prof. (Science)	—	—	—	—	—	—	—	—	—	—	—
	Postgraduate	—	—	—	—	—	—	—	—	—	—	—
Nursing School	3 yrs.	—	—	—	—	—	—	—	—	—	—	—
Teachers College	1 yr.	—	—	—	—	—	—	—	—	—	—	—
	2 yrs.	—	—	—	—	—	—	—	—	—	—	—
Technical College and Vocational Institute	1 yr.	—	—	—	—	—	—	.1	- 2.5	.7	- 1.8	- 1.7
	2 yrs.	—	—	—	—	—	—	.1	- 2.5	.7	- 1.8	- 1.7
	3 yrs.	—	—	—	—	—	—	.1	—	—	—	.1
	4 yrs.	—	—	—	—	—	—	—	—	—	—	—
Apprenticeship	2 yrs.	—	—	—	—	—	—	—	—	—	—	—
	4 yrs.	—	—	—	—	—	—	—	—	—	—	—
	6 yrs.	—	—	—	—	—	—	—	—	—	—	—
Systematic On-the-job Training	6 months	—	—	—	—	—	—	—	- 1.5	.4	- 1.1	- 1.1
	1 yr.	—	—	—	—	—	—	—	—	—	—	—
	2 yrs.	—	—	—	—	—	—	—	—	—	—	—
	3 yrs.	—	—	—	—	—	—	—	—	—	—	—
	4 yrs.	—	—	—	—	—	—	—	—	—	—	—

Adjustments for the "Not Stated" Category and Unemployment

In Table 18 the preliminary projections of the required new entrants between 1961 and 1970 by occupation class and educational qualifications are given. They are preliminary for two reasons. First; they exclude the "not stated" category from the 1961 occupation structure but not from the 1970 structure so that the projection of required entrants has an upward bias.[7] Second, because the required entrants were computed by comparing the 1961 labour force and 1970 employment, no account is taken of those who will be unemployed in 1970. Adjustments are made for both these effects.

Since the "not stated" group is subsumed in the projection for 1970, its number in 1961 minus its 1961-70 attrition represents manpower "available" in 1970. The attrition rate of this group, based on its 1961 age-sex structure, is estimated at about fourteen per cent for men and seven per cent for women. In numbers this amounts to 20.5 thousand, which means that there are 147.5 thousand survivors in this group in 1970. This latter number is distributed among the occupation groups in proportion to the 1961 "stated" numbers in them. The "not stated" in each occupational group is then distributed among the various education levels in proportion to the 1961 percentage education structure of the "stated" in the occupation group. This numerical occupation-education structure of the "not stated" group is then subtracted from the numerical occupation-education structure of the projection of required entrants made for the "stated" occupations. (See Table 19.)

The education structure of the unemployed in 1970 was projected by distributing the total number of unemployed in 1970, which has been projected by the Economic Council, that is, 244,000, proportionately to the required education structure of total employment that has been projected in this paper. (See Table 20.) In other words, it has been assumed that the percentage education structure of unemployment will be the same as that of employment requirements. However on the basis of past experience it is likely that the unemployed will be concentrated at the low education levels. This fact could not be taken into consideration in the statistical projections but it should be kept in mind in evaluating the results. The effect is a slight overestimate of the overall educational requirements.

The Projection Results

According to this projection, all but 7.5 per cent of the labour force entrants between 1961 and 1970, that is all except 202,000, require completed elementary education. Furthermore, the projection points to the need for the transfer of about 40,000 people in jobs in logging, mining, fishing and transportation and communication occupations requiring no elementary education to other no-education jobs in service and labouring occupations. In the mining occupations an exodus at all education levels is required according to the projection.

At least some high school education is required of 62 per cent of the labour force entrants, (1,674,000), and completion of 38 per cent (1,015,000). A large proportion of the 24 per cent (659,000) with only partial high school education is in the manufacturing occupations and it is concentrated in the technical branch of the high school system. However, the required completions are concentrated in the academic branch, which amount to 24 per cent of the labour force entrants (644,000) compared with 10 per cent in the commercial branch and 4 per cent in the technical. Most of the requirements for academic high school graduates are for professional occupations and these generally require post-secondary schooling.

The requirements in terms of trade school education at the secondary level are projected to amount to 4 per cent of the labour force entrants (105,000). Four years apprenticeship is required of 13 per cent of the labour force entrants (351,000). This is probably an inflated projection because in many jobs on-the-job training serves as an adequate substitute. At the post-secondary level, non-academic schooling is required for 10 per cent of the labour force entrants (263,000). Of these, 59,000 are in nursing training, 12,000 in elementary teacher training and 40,000 in secondary teacher training. The figures for persons with nursing and

[7] This was an oversight no the part of one of the authors (Peter Penz) resulting from the fact that he used the data in the study *Manpower in Canada, 1931 to 1961 – Historical Statistics of the Canadian Labour Force*, Department of Manpower and Immigration, where the "not stated" group is given separately. He became aware only later of the inconsistency that this distinction created within this report (since in the projec- and of the problem created thereby. However, because of time limitations it was considered preferable to make subsequent adjustments in the final results rather than to recalculate all the stages of the projection of educational requirements. This short-cut may be methodologically somewhat untidy, but is quantitatively of no significance.

TABLE 19

Adjustments for the "Not Stated" Group

Required Educational Qualifications		Managerial			Professional			Clerical		
		"Stated" Group in 1961		"Not Stated" Survivors in 1970	"Stated" Group in 1961		"Not Stated" Survivors in 1970	"Stated" Group in 1961		"Not Stated" Survivors in 1970
		('000)	%	('000)	('000)	%	('000)	('000)	%	('000)
Total		700.0	100.0	12.2	977.0	100.0	14.6	1,186.0	100.0	19.8
Per Cent of "Stated" Labour Force in 1961		(8.3)			(9.9)			(13.4)		
Elementary Education	VIII	668.1	95.5	11.7	977.0	100.0	14.6	1,186.0	100.0	19.8
High School	IX	553.0	79.0	9.7	863.0	88.3	12.9	69.6	5.9	1.2
– Academic	X	497.0	71.0	8.7	863.0	88.3	12.9	69.6	5.9	1.2
	XI	434.0	62.0	7.6	863.0	88.3	12.9	–	–	–
	XII	364.0	52.0	6.4	863.0	88.3	12.9	–	–	–
– Technical	IX	–	–	–	64.0	6.6	1.0	–	–	–
	X	–	–	–	64.0	6.6	1.0	–	–	–
	XI	–	–	–	64.0	6.6	1.0	–	–	–
	XII	–	–	–	64.0	6.6	1.0	–	–	–
– Commercial	IX	–	–	–	30.0	3.1	0.5	724.5	61.1	12.1
	X	–	–	–	30.0	3.1	0.5	724.5	61.1	12.1
	XI	–	–	–	30.0	3.1	0.5	661.1	55.7	11.0
	XII	–	–	–	30.0	3.1	0.5	582.6	49.1	9.7
Trade School	1 yr.	–	–	–	–	–	–	–	–	–
	2 yrs.	–	–	–	–	–	–	–	–	–
University	General	105.0	15.0	1.8	131.0	13.4	2.0	–	–	–
Degree	Hon. & Prof. (Arts)	–	–	–	408.0	4.2	0.6	–	–	–
(Final)	Hon. & Prof. (Science)	–	–	–	172.0	17.6	2.6	–	–	–
	Postgraduate	–	–	–	23.0	2.4	0.3	–	–	–
Nursing School	3 yrs.	–	–	–	111.5	11.4	1.7	–	–	–
Teachers College	1 yr.	–	–	–	200.6	20.5	3.0	–	–	–
	2 yrs.	–	–	–	121.2	12.4	1.8	–	–	–
Technical	1 yr.	–	–	–	213.5	21.9	3.2	–	–	–
College and	2 yrs.	–	–	–	213.5	21.9	3.2	–	–	–
Vocational	3 yrs.	–	–	–	7.6	0.8	0.1	–	–	–
Institute	4 yrs.	–	–	–	1.5	0.2	–	–	–	–
Apprenticeship	2 yrs.	–	–	–	30.0	3.1	0.5	–	–	–
	4 yrs.	–	–	–	30.0	3.1	0.5	–	–	–
	6 yrs.	–	–	–	30.0	3.1	0.5	–	–	–
Systematic	6 months	–	–	–	–	–	–	–	–	–
On-the-job	1 yr.	–	–	–	–	–	–	–	–	–
Training	2 yrs.	–	–	–	–	–	–	–	–	–
	3 yrs.	–	–	–	–	–	–	–	–	–
	4 yrs.	–	–	–	–	–	–	–	–	–

TABLE 19 *(Cont'd.)*

Required Educational Qualifications		Commercial and Financial			Manufacturing and Mechanical			Construction		
		"Stated" Group in 1961		"Not Stated" Survivors in 1970	"Stated" Group in 1961		"Not Stated" Survivors in 1970	"Stated" Group in 1961		"Not Stated" Survivors in 1970
		('000)	%	('000)	('000)	%	('000)	('000)	%	('000)
Total		666.0	100.0	12.4	1,368.0	100.0	25.5	395.0	100.0	7.5
Per Cent of "Stated" Labour Force in 1961		(8.4)			(17.3)			(5.1)		
Elementary Education	VIII	657.7	98.8	12.2	1,322.7	96.7	24.7	395.0	100.0	7.5
High School	IX	98.4	14.8	1.8	4.5	0.3	–	–	–	–
– Academic	X	98.4	14.8	1.8	4.5	0.3	–	–	–	–
	IX	48.3	7.3	0.9	4.5	0.3	–	–	–	–
	XII	48.3	7.3	0.9	4.5	0.3	–	–	–	–
– Technical	IX	5.2	0.8	–	807.6	59.0	15.1	270.5	68.5	5.2
	X	5.2	0.8	–	782.9	57.2	14.6	144.7	36.6	2.8
	XI	5.2	0.8	–	154.2	11.3	2.9	96.7	24.5	1.8
	XII	5.2	0.8	–	84.6	6.2	1.6	37.8	9.6	0.7
– Commercial	IX	30.8	4.6	0.6	–	–	–	–	–	–
	X	30.8	4.6	0.6	–	–	–	–	–	–
	XI	30.8	4.6	0.6	–	–	–	–	–	–
	XII	15.5	2.3	0.3	–	–	–	–	–	–
Trade School	1 yr.	–	–	–	93.7	6.8	1.7	–	–	–
	2 yrs.	–	–	–	17.4	1.3	0.3	–	–	–
University	General	22.0	3.3	0.4	–	–	–	–	–	–
Degree	Hon. & Prof. (Arts)	5.5	0.8	0.1	–	–	–	–	–	–
(Final)	Hon. & Prof. (Science)	–	–	–	–	–	–	–	–	–
	Postgraduate	–	–	–	–	–	–	–	–	–
Nursing School	3 yrs.	–	–	–	–	–	–	–	–	–
Teachers College	1 yr.	–	–	–	–	–	–	–	–	–
	2 yrs.	–	–	–	–	–	–	–	–	–
Technical	1 yr.	11.1	1.7	0.2	27.6	2.0	0.5	–	–	–
College and	2 yrs.	11.1	1.7	0.2	27.6	2.0	0.5	–	–	–
Vocational	3 yrs.	6.0	0.9	0.1	4.5	0.3	–	–	–	–
Institute	4 yrs.	–	–	–	4.5	0.3	–	–	–	–
Apprenticeship	2 yrs.	–	–	–	627.1	45.8	11.7	369.1	93.5	7.0
	4 yrs.	–	–	–	587.8	43.0	11.0	369.1	93.5	7.0
	6 yrs.	–	–	–	38.7	2.8	0.7	–	–	–
Systematic	6 months	–	–	–	549.0	40.1	10.2	64.6	16.4	1.2
On-the-job	1 yr.	–	–	–	258.9	18.9	4.8	4.0	1.0	–
Training	2 yrs.	–	–	–	205.4	15.0	3.8	4.0	1.0	–
	3 yrs.	–	–	–	163.0	11.9	3.0	–	–	–
	4 yrs.	–	–	–	163.0	11.9	3.0	–	–	–

TABLE 19 *(Cont'd)*

Required Educational Qualifications		Labourers			Transportation and Communication			Services		
		"Stated" Group in 1961		"Not Stated" Survivors in 1970	"Stated" Group in 1961		"Not Stated" Survivors in 1970	"Stated" Group in 1961		"Not Stated" Survivors in 1970
		('000)	%	('000)	('000)	%	('000)	('000)	%	('000)
Total		352.0	100.0	8.1	611.0	100.0	11.7	965.0	100.0	15.8
Per Cent of "Stated" Labour Force in 1961		(5.5)			(7.9)			(10.7)		
Elementary Education	VIII	–	–	–	594.1	97.2	11.3	559.8	58.0	9.2
High School	IX	–	–	–	54.9	9.0	1.0	117.3	12.2	1.9
– Academic	X	–	–	–	54.9	9.0	1.0	117.3	12.2	1.9
	XI	–	–	–	54.9	9.0	1.0	21.7	2.3	0.4
	XII	–	–	–	12.6	2.1	0.2	21.7	2.3	0.4
– Technical	IX	–	–	–	65.9	10.8	1.3	2.3	0.2	–
	X	–	–	–	39.8	6.5	0.8	2.3	0.2	–
	XI	–	–	–	14.9	2.5	0.3	1.0	0.1	–
	XII	–	–	–	14.9	2.5	0.3	1.0	0.1	–
– Commercial	IX	–	–	–	16.8	2.8	0.3	–	–	–
	X	–	–	–	16.8	2.8	0.3	–	–	–
	XI	–	–	–	5.7	0.9	0.1	–	–	–
	XII	–	–	–	–	–	–	–	–	–
Trade School	1 yr.	–	–	–	–	–	–	66.7	6.9	1.1
	2 yrs.	–	–	–	–	–	–	–	–	–
University Degree (Final)	General	–	–	–	–	–	–	–	–	–
	Hon. & Prof. (Arts)	–	–	–	–	–	–	–	–	–
	Hon. & Prof. (Science)	–	–	–	–	–	–	–	–	–
	Postgraduate	–	–	–	–	–	–	–	–	–
Nursing School	3 yrs.	–	–	–	–	–	–	–	–	–
Teachers College	4 yrs.	–	–	–	–	–	–	–	–	–
	2 yrs.	–	–	–	–	–	–	–	–	–
Technical College and Vocational Institute	1 yr.	–	–	–	20.0	3.3	0.4	–	–	–
	2 yrs.	–	–	–	20.0	3.3	0.4	–	–	–
	3 yrs.	–	–	–	9.2	1.5	0.2	–	–	–
	4 yrs.	–	–	–	9.2	1.5	0.2	–	–	–
Apprenticeship	2 yrs.	–	–	–	75.6	12.4	1.4	71.5	7.4	1.2
	4 yrs.	–	–	–	75.6	12.4	1.4	3.1	0.3	–
	6 yrs.	–	–	–	–	–	–	–	–	–
Systematic On-the-job Training	6 months	–	–	–	282.7	46.3	5.4	68.5	7.1	1.1
	1 yr.	–	–	–	233.0	46.3	5.4	68.5	7.1	1.1
	2 yrs.	–	–	–	–	–	–	5.1	0.5	–
	3 yrs.	–	–	–	–	–	–	1.3	0.1	–
	4 yrs.	–	–	–	–	–	–	1.3	0.1	–

TABLE 19 *(Cont'd.)*

Required Educational Qualifications		Agriculture			Logging			Fishing		
		"Stated" Group in 1961		"Not Stated" Survivors in 1970	"Stated" Group in 1961		"Not Stated" Survivors in 1970	"Stated" Group in 1961		"Not Stated" Survivors in 1970
		('000)	%	('000)	('000)	%	('000)	('000)	%	('000)
Total		554.0	100.0	16.7	54.0	100.0	1.6	22.0	100.0	0.6
Per Cent of "Stated" Labour Force in 1961		(11.3)			(1.1)			(0.4)		
Elementary Education	VIII	378.1	68.3	11.4	16.3	30.1	0.5	–	–	–
High School	IX	–	–	–	–	–	–	–	–	–
– Academic	X	–	–	–	–	–	–	–	–	–
	XI	–	–	–	–	–	–	–	–	–
	XII	–	–	–	–	–	–	–	–	–
– Technical	IX	378.1	68.3	11.4	–	–	–	–	–	–
	X	378.1	68.3	11.4	–	–	–	–	–	–
	XI	378.1	68.3	11.4	–	–	–	–	–	–
	XII	378.1	68.3	11.4	–	–	–	–	–	–
– Commercial	IX	–	–	–	–	–	–	–	–	–
	X	–	–	–	–	–	–	–	–	–
	XI	–	–	–	–	–	–	–	–	–
	XII	–	–	–	–	–	–	–	–	–
Trade School	1 yr.	–	–	–	11.1	20.6	0.3	–	–	–
	2 yrs.	–	–	–	–	–	–	–	–	–
University	General	–	–	–	–	–	–	–	–	–
Degree	Hon. & Prof. (Arts)	–	–	–	–	–	–	–	–	–
(Final)	Hon. & Prof. (Science)	–	–	–	–	–	–	–	–	–
	Postgraduate	–	–	–	–	–	–	–	–	–
Nursing School	3 yrs.	–	–	–	–	–	–	–	–	–
Teachers College	1 yr.	–	–	–	–	–	–	–	–	–
	2 yrs.	–	–	–	–	–	–	–	–	–
Technical	1 yr.	–	–	–	–	–	–	–	–	–
College and	2 yrs.	–	–	–	–	–	–	–	–	–
Vocational	3 yrs.	–	–	–	–	–	–	–	–	–
Institute	4 yrs.	–	–	–	–	–	–	–	–	–
Apprenticeship	2 yrs.	–	–	–	–	–	–	–	–	–
	4 yrs.	–	–	–	–	–	–	–	–	–
	6 yrs.	–	–	–	–	–	–	–	–	–
Systematic	6 months	–	–	–	–	–	–	–	–	–
On-the-job	1 yr.	–	–	–	–	–	–	–	–	–
Training	2 yrs.	–	–	–	–	–	–	–	–	–
	3 yrs.	–	–	–	–	–	–	–	–	–
	4 yrs.	–	–	–	–	–	–	–	–	–

TABLE 19 *(Cont'd)*

Required Educational Qualifications		Mining			"Stated" Group in 1961	
		"Stated" Group in 1961		"Not Stated" Survivors in 1970		
		('000)	%	('000)	('000)	%
Total		32.0	100.0	1.0	2,444.6	100.0
Per Cent of "Stated" Labour Force in 1961		(0.7)				
Elementary Education	VIII	26.7	83.4	0.9	2,261.2	92.5
High School	IX	–	–	–	770.8	31.5
– Academic	X	–	–	–	753.8	30.8
	XI	–	–	–	612.9	25.1
	XII	–	–	–	586.0	24.0
– Technical	IX	8.2	25.7	0.3	457.7	18.7
	X	8.2	25.7	0.3	432.0	17.8
	XI	5.1	15.9	0.2	150.7	6.2
	XII	5.1	15.9	0.2	103.3	4.2
– Commercial	IX	–	–	–	293.6	12.0
	X	–	–	–	293.6	12.0
	XI	–	–	–	275.8	11.3
	XII	–	–	–	233.8	9.6
Trade School	1 yr.	–	–	–	95.1	3.9
	2 yrs.	–	–	–	5.9	0.2
University	General	–	–	–	136.8	5.6
Degree	Hon. & Prof. (Arts)	–	–	–	19.9	0.8
(Final)	Hon. & Prof. (Science)	–	–	–	77.3	3.2
	Postgraduate	–	–	–	13.1	0.5
Nursing School	3 yrs.	–	–	–	53.5	2.2
Teachers College	1 yr.	–	–	–	47.3	1.9
	2 yrs.	–	–	–	10.6	0.4
Technical	1 yr.	3.8	12.0	0.1	138.4	5.7
College and	2 yrs.	3.8	12.0	0.1	138.4	5.7
Vocational	3 yrs.	0.7	2.2	–	9.4	0.4
Institute	4 yrs.	–	–	–	5.8	0.2
Apprenticeship	2 yrs.	–	–	–	365.0	14.9
	4 yrs.	–	–	–	318.9	13.1
	6 yrs.	–	–	–	24.1	1.0
Systematic	6 months	1.9	5.9	–	320.6	13.1
On-the-job	1 yr.	–	–	–	188.3	7.7
Training	2 yrs.	–	–	–	65.0	2.7
	3 yrs.	–	–	–	57.9	2.4
	4 yrs.	–	–	–	57.9	2.4

elementary teacher training, however, are likely to be low projections because such persons tend to have relatively short periods of labour force participation. The remaining 152,000 include those with schooling in art, chiropractice and navigation, but consist predominately of persons with at least two years at a technical institute. This figure may be somewhat inflated, again because of the substitutability of experience for formal schooling.

The projection of manpower requirements for university graduates amounts to 10 per cent of the labour force entrants (272,000). This too may be an inflated figure because of the reporting bias in the Census. For example, in 1961 20 per cent of those who were reported as being mechanical engineers had no formal post-secondary education at all. Many of them probably did not really perform engineering functions. The breakdown into the different types of degrees is not really very reliable. What may, however, be significant is that among the required honours and professional degree graduates the projected ratio of arts-oriented to science-oriented degrees is about 1:4.

TABLE 20

Final Projection of the Required Labour Force Entrants, 1961-70, by Occupation Groups and Educational Qualifications

Required Educational Qualifications		Occupation Groups								
		Managerial	Professional	Clerical	Commercial and Financial	Manufacturing and Mechanical	Construction	Labourers	Transportation and Communication	Services
		('000)	('000)	('000)	('000)	('000)	('000)	('000)	('000)	('000)
Total		288	403	422	218	447	104	45	163	369
Elementary Education	VIII	289	403	422	216	433	104	–	167	211
High School	IX	237	364	41	37	4	–	–	46	40
– Academic	X	220	364	41	37	4	–	–	46	40
	XI	201	364	–	22	4	–	–	11	10
	XII	180	364	–	22	4	–	–	6	10
– Technical	IX	–	28	–	1	317	66	–	22	1
	X	–	28	–	1	317	50	–	12	1
	XI	–	28	–	1	56	36	–	5	–
	XII	–	28	–	1	27	19	–	5	–
– Commercial	XI	–	8	271	9	–	–	–	6	–
	X	–	8	271	9	–	–	–	6	–
	XI	–	8	257	9	–	–	–	2	–
	XII	–	8	223	3	–	–	–	–	–
Trade School	1 yr.	–	–	–	–	45	–	–	–	46
	2 yrs.	–	–	–	–	6	–	–	–	–
University	General	68	58	–	10	–	–	–	–	–
Degree	Hon. & Prof. (Arts)	–	19	–	1	–	–	–	–	–
(Final)	Hon. & Prof. (Science)	–	77	–	–	–	–	–	–	–
	Postgraduate	–	13	–	–	–	–	–	–	–
Nursing School	3 yrs.	–	53	–	–	–	–	–	–	–
Teachers College	1 yr.	–	47	–	–	–	–	–	–	–
	2 yrs.	–	11	–	–	–	–	–	–	–
Technical	1 yr.	–	124	–	4	12	–	–	5	–
College and	2 yrs.	–	124	–	4	12	–	–	5	–
Vocational	3 yrs.	–	4	–	2	3	–	–	2	–
Institute	4 yrs.	–	1	–	–	3	–	–	2	–
Apprenticeship	2 yrs.	–	8	–	–	215	94	–	21	27
	4 yrs.	–	8	–	–	195	94	–	21	1
	6 yrs.	–	8	–	–	16	–	–	–	–
Systematic	6 months	–	–	–	–	164	27	–	107	23
On-the-job	1 yr.	–	–	–	–	79	1	–	85	23
Training	2 yrs.	–	–	–	–	64	1	–	–	–
	3 yrs.	–	–	–	–	58	–	–	–	–
	4 yrs.	–	–	–	–	58	–	–	–	–

TABLE 20 *(Cont'd.)*

Required Educational Qualifications		Occupation Groups				Aggregation			
		Agriculture	Logging	Fishing	Mining	Employment		Unemployment	Final Total
		('000)	('000)	('000)	('000)	('000)	%	('000)	('000)
Total		31	−18	−1	−26	2,445	100.0	244	2,689
Elementary Education	VIII	27	4	—	−14	2,261	92.5	226	2,487
High School	IX	—	—	—	—	771	31.5	77	848
— Academic	X	—	—	—	—	754	30.8	75	829
	XI	—	—	—	—	613	25.1	61	674
	XII	—	—	—	—	586	24.0	58	644
— Technical	IX	27	—	—	−4	458	18.7	46	503
	X	27	—	—	−4	432	17.7	43	475
	XI	27	—	—	−2	151	6.2	15	166
	XII	27	—	—	−2	103	4.2	10	114
— Commercial	IX	—	—	—	—	294	12.0	29	323
	X	—	—	—	—	294	12.0	29	323
	XI	—	—	—	—	276	11.3	28	303
	XII	—	—	—	—	234	9.6	23	257
Trade School	1 yr.	—	4	—	—	95	3.9	9	105
	2 yrs.	—	—	—	—	6	0.2	1	7
University	General	—	—	—	—	137	5.6	14	150
Degree	Hon. & Prof. (Arts)	—	—	—	—	20	0.8	2	22
(Final)	Hon. & Prof. (Science)	—	—	—	—	77	3.2	8	85
	Postgraduate	—	—	—	—	13	0.5	1	14
Nursing School	3 yrs.	—	—	—	—	53	2.2	5	59
Teachers College	1 yrs.	—	—	—	—	47	1.9	5	52
	2 yrs.	—	—	—	—	11	0.4	1	12
Technical	1 yr.	—	—	—	−2	138	5.7	14	152
College and	2 yrs.	—	—	—	−2	138	5.7	14	152
Vocational	3 yrs.	—	—	—	—	9	0.4	1	10
Institute	4 yrs.	—	—	—	—	6	0.2	1	6
Apprenticeship	2 yrs.	—	—	—	—	365	14.9	36	401
	4 yrs.	—	—	—	—	319	13.0	32	351
	6 yrs.	—	—	—	—	24	1.0	2	26
Systematic	6 months	—	—	—	−1	321	13.1	32	353
On-the-job	1 yr.	—	—	—	—	188	7.7	19	207
Training	2 yrs.	—	—	—	—	65	2.7	6	71
	3 yrs.	—	—	—	—	58	2.4	6	64
	4 yrs.	—	—	—	—	58	2.4	6	64

It should be remembered that this projection is based on an extrapolation of the occupation structure based on *ex post* data and on a list of education requirements by occupation specified as unique sets and in a discretionary manner. It therefore contains two major shortcomings. 1) It is not a projection of manpower requirements in a pure way; i.e., unadulterated by supply trends. 2) The educational specifications involve much guessing and do not allow for alternative sets of educational qualifications for each occupation.

No immediate estimate as to whether these requirements are likely to be satisfied can be made. First of all, this would require a thorough analysis of the availability of educational and training facilities and of the extent to which there is demand by students and adults to utilize them. Secondly, the effectiveness of immigration policy in its attempt to supplement domestic manpower supplies with immigrant manpower has to be assessed. Nevertheless, a crude indication of future developments is given by the projections and by a quick glance at the output of the currently most crucial part of the education system, from the point of view of manpower requirements, that of technical education.

In the mid-1960's, the annual output of institutes of technology was only half of the annual average necessary to arrive at the projected requirements in 1970.[8] In the case of apprenticeship, the ratio of supply to projected requirements is even worse.[9] This partly reflects the fact that not all those in the occupations to which apprenticeship training and, to a lesser extent, technological post-secondary education are attributed absolutely need these qualifications and that for them alternative qualifications suffice. To a certain extent, too, the gap will be filled by immigration. According to the projection, net immigration will amount to only 6% of the projection of required new entrants, and gross immigration 20% but its composition may be biased toward the shortage skills. Ultimately, however, these crude indications of gaps also suggest that employers may have to make do with manpower which does not quite meet the requirements of their production methods and quotas.

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[8] D.B.S., Education Division, *Canadian Institutes of Technology and some Related Institutions: Full-Time Post-Secondary Enrolment as of October 1966*, April 1967, Tables 2 and 3.

[9] D.B.S., *Survey of Vocational Education and Training, 1963-64*, catalogue no. 81-209, Queen's Printer, April 1967, Table 10.

CHAPTER V

SUMMARY AND CONCLUSIONS

The Economic Council's Projection Framework

The foregoing projections are based on the Economic Council's projections of employment in agriculture, community service, public administration and the commercial non-agricultural sector and of unemployment. A target of 97 per cent employment was set, and the employment trends in agriculture, community service and public administration were analyzed and projected. The residual of the projected labour force was allocated to the commercial non-agricultural sector. This sector had to be disaggregated into finer industry groups, before the occupation structures could be derived.

A Review of the Concepts

Two concepts in the study are crucial. One is that of manpower requirements and the other that of a projection in this particular context. Manpower requirements basically mean the occupational and educational structure required of the labour force by the prevailing structure of output and technology. If they are not matched by the structure of manpower supply, either the structure of labour demand must make adjustments through the market mechanism or shortages and redundancies will occur. Manpower requirements are ascertained because there are lags and imperfections in the labour market adjustment mechanism, which certain policy measures may be able to reduce or even eliminate.

The projections are not forecasts in this case, because they are based on assumptions which cannot be claimed to be likely occurrences. Rather the assumptions were frequently selected for their simplicity and computational convenience. The most important of them are reiterated in the following section.

The Assumptions

There is one basic assumption which is essential to the acceptability of the projections and that is that

(i) manpower requirements will change in accordance with past trends.

For the projection of the industry breakdown of manpower requirements in particular it is assumed that

(ii) changes in the percentage industry structure of employment follow linear trends (except for cyclical fluctuations);

(iii) the breakdown of the "industry unspecified" group corresponds to the percentage distribution of employment by specified industry group;

(iv) the cyclical pattern in the industry structure of employment is fully correlated with the overall unemployment rate;

(v) the industry structure in the past has been determined primarily by the structure of output and by the prevailing technology rather than by labour supply conditions;

(vi) furthermore, the structure of output and technology are independent of the skill structure of manpower supply.

Similarly, the projection of the industry divisions' occupation structures is based on the assumptions that

(vii) changes in the percentage occupation structures follow linear trends;

(viii) the breakdown of the "occupation not stated" group in each industry division corresponds to the percentage distribution of employment by stated occupation group in that industry division;

(ix) the percentage occupation structure of employment in each industry division, cyclically adjusted, is represented adequately by the percentage occupation distribution of the labour force in the industry division;

(x) the occupation structures in the past have been determined primarily by the prevailing technology rather than supply conditions.

Two types of projections of the education structure of manpower requirements have been made. One of them consists of the extrapolation of the education structure of each occupation group. The other involves the specification of the required educational qualifications for each occupation class and provides a projection of the required entrants between 1961 and 1970 rather than of employment in 1970. However, both of them are based on the assumption that

(xi) the 1952-63 trend is more representative of the long-run trend in the industry structure of employment than the 1946-63 trend.

The extrapolation of the education structure of each occupation group involves the assumptions that

(A-xii) the heterogeneity of educational qualifications found in each occupation group is primarily a reflection of the heterogeneity of productive functions within the occupation group;

(A-xiii) the structure of qualifications and functions are primarily determined by technology rather than by manpower supply conditions.

The second projection of manpower requirements by educational qualifications, given in terms of required entrants, involves a more elaborate set of assumptions. Aside from the assumed educational requirements of each occupation class, there are the following major assumptions. In the disaggregation of the projected occupation groups into occupation classes it is assumed that

(B-xii) the distribution of the occupation classes in each occupation group among industries is proportionate to the distribution of that occupation group among the industries;

(B-xiii) the percentage occupation-class structure of the labour force in each occupation group has in the past adequately represented the corresponding structure of employment if the latter were adjusted to full-employment conditions.

The projection of new entrants requires the assumptions that

(B-xiv) the rate of attrition due to deaths and withdrawals from the labour force in any occupation class is determined solely by its age-sex structure and the age-sex-specific attrition rates are the same in all occupation classes;

(B-xv) movements between occupations cancel each other out.

The projection of the education structure of the required entrants rests on the assumptions that

(B-xvi) the required set of educational qualifications for each occupation class is unique;

(B-xvii) there is no upgrading of the experienced labour force, that is, of those who entered the labour force before 1961;

(B-xviii) drop-outs re-entering the labour force do not require additional education.

In addition, the projection of the non-comparable classes and the managerial group requires the assumptions that

(B-xix) the occupation-class structure of the non-comparable classes in each occupation group weighted by the specified 1960-70 educational requirements will continue to change along its historical trends;

(B-xx) the educational qualifications required of the managerial group will change from the actual education structure in 1961 to the education structure in 1970 extrapolated from the historical trend in the actual education structure;

(B-xxi) the education structure of the group of owners and managers dropping out of the labour force in 1961-70 is the same as the education structure of all managers in the labour force in 1946.

The final adjustments involved the assumptions that

(B-xxii) the survivors of the "occupation not stated" group are distributed among the occupation groups and education levels in proportion to the occupation-education matrix of the 1961 "stated" labour force;

(B-xxiii) the education structure of the unemployed in 1970 is proportionately the same as that of employment.

This list of assumptions is not meant to be exhaustive, but only to point to the major premises involved in the projections.

It will be clear from this list that the projections are not based on a completely realistic set of assumptions. For example, in assessing assumption (i) it will be obvious that changes frequently deviate from preceding trends. Nor is it likely that assumption (vi) is entirely correct, since certain types of technological changes may be introduced in direct response to labour shortages, or such scarcities may change the structure of final demand by inducing changes in the price structure of final products. Similarly the assumption that inter-occupational movements cancel each other out (B-xv) is a highly improbable proposition. As has been stated above, the best justification for some of the assumptions is that of convenience.

Any distortions in the projections resulting from unrealistic assumptions can only be accounted for by making discretionary modifications in the

final results. There is little that can be done about the difficulties involved in assumption (i). But any distortions resulting, for example, from assumptions (vi) and (B-xv) might be reduced by taking into account certain equilibration effects. If the projected structure of manpower requirements is compared with a projection of the structure of manpower supplies, a picture of *potential* imbalances can be obtained. They are only potential because they ignore any feedback from these imbalances on the structures of manpower demand and supply. This feedback might be considered informally by making discretionary judgments about the effects of imbalances on technology, on the structure of output and on labour mobility, which in turn dilute the imbalances.

The Data Sources

For the projection of the industry structure of employment Labour Force Survey data was used. The occupation structure in each industry division was projected on the basis of Census data adjusted for intercensal comparability in Volume 1. Census data was also used for the first type of projection of the education structure in each occupation group. Discretionary judgment was used in the specification of the requisite educational qualifications for each occupation class in the second type of projection of the education structure.

The Findings

The projection of the industry structure of employment opportunities in 1970, as derived from the Economic Council projections, indicates relatively rapid growth in the community service, public administration (government), finance, business and personal service industries and declines in agriculture and forestry. Employment opportunities in construction and public utilities are projected to grow somewhat more rapidly than total employment and in manufacturing and transportation and communication somewhat more slowly. However, this projection does not take account of the investment requirements involved in the Economic Council's growth projection, a factor which affects construction and manufacturing. In the case of other industries, the evidence is not sufficiently unambiguous to draw conclusions from it.

According to the projection of the occupation structure of employment opportunities, the sharpest growth will occur in the professional group, and relatively rapid increases will characterize the clerical and service occupations. The primary occupations are projected to experience noteworthy declines, and no significant increases are seen in the case of labourers. The projections of the other occupation groups follow approximately the growth pattern of the whole labour force.

The projection of the required education structure of the stock of manpower leads to the rather obvious result that the proportion of job opportunities requiring no more than elementary education is declining while the proportion of job opportunities for those with at least some post-secondary education is increasing. More interesting is the projection of the required education structure of the labour force entrants in 1961-70, based on the discretionary determination of the educational requirements for the various occupation classes. According to that all but 7.5 per cent of the labour force entrants will have to have completed at least elementary schooling. Completion of high school education is required of nearly two fifths. One-sixth should be qualified with trade school or apprenticeship training, although part of that requirement might be met by on-the-job training. At least 4 per cent of the entrants should be qualified nurses or teachers and another 5 per cent should be graduates of technical and other non-academic post-secondary institutes, according to this projection. University graduates should make up one tenth of the labour force entrants. Among the honours and professional graduates the required arts-science ratio is 1:4. Perhaps the most conspicuous result of the projection is the heavy demand for persons with technical and scientific post-secondary education, including a large proportion from non-academic institutions. A comparison with the current output of technical institutes indicated a shortage of facilities in that part of the education system.

"Projecting" the Method of Manpower Projections

The next step in making long-range projections which will ultimately become useful for manpower policy and planning at the governmental as well as the enterprise level should be the projection of the structure of labour supply. Then prospective structural imbalances can be determined, even though it will still remain unclear how large these imbalances will remain after labour mobility has worn them down to a certain extent. This would have to be assessed on a discretionary basis at that stage.

Aside from refining the method of projecting manpower requirements by improving the occupation-education coefficients, an interindustry analysis

of output should be incorporated in the model to generate the industry structure of manpower requirements. Such an analysis might also generate productivity growth rates which might then improve the projection of the occupation structures in the respective industries.

Finally, the projection of manpower requirements and supplies should be integrated into one big model to permit interaction between the two as it actually occurs in the labour market. For example, a model might be developed in which changes in demand and supply are partly determined by the discrepancies between the levels of demand and supply. This would permit the removal of the implicit assumption that labour supply does and should do all the adjusting. Changes in the structure of output and in the techniques of production necessary to accommodate manpower constraints could then be explicitly taken into account.